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E. W. Tinker Becomes A.P.&P.A. Secretary

Assistant In Charge of State and Private Forestry, U. S. Department of Agriculture, To Assume Duties of Executive Secretary of American Paper & Pulp Association On January 1, 1940 — Fifth Forester In Position.

WASHINGTON, D. C., December 18, 1939—E. W. Tinker, assistant chief in charge of state and private forestry for the Forest Service, United States Department of Agriculture, is resigning to become executive secretary of the American Paper and Pulp Association, F. A. Silcox, Chief of the Forest Service, announced on December 15.

He will be the fifth technically trained forester to hold the position, and will coordinate the activities of 22 associations in the United States concerned with pulp and paper production.

Will Assume Duties January 1

Mr. Tinker, who will assume his new duties in New York on January 1, entered the U. S. Forest Service in 1915. He was born and grew up in Fenton, Michigan and is a graduate of Michigan State College and the Yale Forest School.

Appointed Regional Forester in 1929

His interest in forestry developments in the Lake States led to the establishment of that new national forest region in 1929 and his appointment as regional forester with headquarters in Milwaukee. The region originally included nine national forests and purchase units in Michigan, Minnesota, and Wisconsin. Later, Missouri, Illinois, Ohio, Indiana, and Iowa, with national forest purchase units in the Ozarks and the Ohio valley, were added.

Under Mr. Tinker's leadership, the North Central region inaugurated one of the largest tree planting programs on record. More than half of the 814,000 acres of successful forest plantations in the nation have since been established in the North Central region.

Mr. Tinker's interest in fostering greater cooperation between the U. S. Forest Service and private forest owners and farmers led to his appointment as assistant chief of the U. S. Forest Service in Washington in 1936. His duties included administration of the Clarke-McNary law providing governmental cooperation with States and individuals, in supplying forest trees at cost, and in fire control.

Organized Timber Salvage Work Last Year

A year ago Mr. Tinker was assigned by F. A. Silcox to organize the New England Timber Salvage Administration to assist the New England States in fire control and timber salvage following the hurricane. No serious fires have occurred in New England thus far in spite of the large amount of slash and the worst summer's drouth in years. A recent report indicates that 86 per cent of the blow-down timber already has been salvaged.

Cooperating with other Federal agencies, the Administration has purchased 613 million board feet of salvage timber and 24,000 cords of pulpwood, paying $7,214,000 to more than 12,000 farmers and small timber owners who were in many cases threatened with bankruptcy because of the loss of their timber. To prevent spoilage of the timber, the Forest Service arranged for the sawing of 232 million board feet of lumber.

Loss to Forest Service

"Earl Tinker's resignation is a loss to the Forest Service," F. A. Silcox said, "but with his new affiliations he will be in a position where he can continue to help conserve the Nation's forest resources through wise use of them."

Pulp and paper production has practically doubled in the past 15 years to meet an annual consumption of 225 pounds of paper and boards per capita. About half of the country's paper requirements are now imported from Canada and northwestern Europe or other nations in spite of investments in pulp mills of more than a hundred million dollars in the South in the last few years.

Plattsburg Mill to Add Fourdrinier

PLATTSBURG, N. Y., December 20, 1939—A million dollar expansion program designed to improve and increase the output of the Plattsburg plant of the Brest Forster-Dixfield Paper Company, has been launched. Mayor Leander A. Bouyea of Plattsburg announced following a conference with officials of the company. First of high speed equipment intended to increase production will be the installation of a 174-inch Fourdrinier, tissue paper machine. The program is not expected to be completed before the latter part of 1940.

In conference with Mayor Bouyea were a number of company officials including B. O. Preu, of New York City, vice president of the company; Samuel S. Stevens, plant manager, and Thomas D. McClellan, plant engineer.

Boom In Paper Production Deemed Possible

Elmer H. Jennings of Thilmany Pulp & Paper Co. In Address At Tri-State Council Meeting Cites Possibility of Record Output — Kimberly-Clark Improvements — To Investigate Stream Pollution — Other News.

[FROM OUR REGULAR CORRESPONDENT]

APPLETON, Wis., December 18, 1939—Paper production will reach the status of a boom once the shutdown of the industry in countries involved in the European conflict is felt in the United States, according to Elmer H. Jennings, vice-president and sales manager of the Thilmany Pulp and Paper Company, Kaukauna, Wis. The current situation was revealed in an address made by him at the Tri-State Council convention of the Pulp, Sulphite and Paper Mills Workers at Kaukauna Sunday, December 10. Approximately 100 delegates were present from Wisconsin, Minnesota and Michigan.

"The paper industry was whirled into a hectic period of buying which might have been disastrous," Mr. Jennings said, "but for the most part the industry has shown sound sense. The violent adjustments following unwise price advances were avoided, and under sound leadership low-priced wrappings and bags advanced and stabilized on levels approximately 10 per cent below the 1937 prices. Future changes will depend on the high costs of production."

Paper Industry In Favorable Situation

It is evident, added the speaker, that the paper industry is facing a situation which calls for deliberate thinking. Twenty-eight per cent of all chemical pulps and 40 per cent of all sulphite pulps, in recent years, have come from abroad. The prices on these pulps, if they can be secured, have advanced 30 to 40 per cent, and the longer the war continues the more radical will these price changes be on these raw materials.

"For the past month the volume of new business has, in the main with most mills, dropped below production, but the backlog of orders should carry most mills over the customary first of the year slump. It seems conservative to state that with increased consumption, buying again will be resumed and any long drawn out decline avoided. With general business conditions good, paper consumption cannot help but continue at a high level, and back of this demand is the further influence of foreign countries to carry on their normal production program. The full effect of the breaking down of production in practically every other country manufacturing paper has not as yet been felt in this country, and it is inevitable that the United States will be called upon to produce in a most abnormal manner.

"It is also inevitable that depression will follow hostilities, and as we face the upward trend we must all keep in mind a keen desire to make the unwinding process as easy as possible."

L. C. Smith and C. R. Seaborne on Program

Speaking on "Employee and Employer Relationship," L. C. Smith, personnel director of Thilmany company, said the long period of freedom from labor troubles in Kaukauna was due in large measure to cooperation with labor unions. He described recent Wisconsin legislation beneficial to labor, and told of the strides being made to reduce and prevent accidents.

C. R. Seaborne, general superintendent of Thilmany, also was on the program, describing the relationship between employer and employee as expressed in the labor union. The impossibility of the management knowing individually each worker made unions necessary to present their problems, he said. Conferences between union representatives and the management have proved mutually beneficial, he pointed out, as has been demonstrated at the Thilmany mill.

Labor's status in England, Norway and Sweden was described by William A. Burnell of Ontario, Canada, who was chairman of a commission making a study in these countries last summer. Although labor in England is poorly organized, he declared, yet Norway is 98 per cent unionized and Sweden even more. Wage rates in these countries are below those of American industries, but workers are benefited by other factors such as lower rents and cooperative projects.

Samuel Sigman, attorney of Appleton, Wis., urged workers to learn the problems of their unions, and not to leave everything to officers and committees.

A banquet and floor show were held in the evening, with George Gerrits as master of ceremonies.

Kimberly-Clark Improvements Under Way

As a part of its improvements at the Badger-Globe mill, Kimberly-Clark Corporation, Neenah, Wis., will build a retaining wall 400 feet long along the Fox River canal, leaving an area to be filled in so as to provide a triangular parking space 60 feet wide and tapering to 20 feet.

This work, being done by Fluor Brothers Construction Company of Oshkosh, Wis., along with construction of a bridge at the rear of the mill to provide a trucking and traffic outlet for more convenient contact with its Lakeview mill. The bridge span will be 100 feet long and 24 feet wide, and will have two five-foot walks. It will be of concrete and is estimated to cost between $18,000 and $20,000.

Wisconsin Large Casein Producer

About 35 per cent of the country's output of casein is now produced in Wisconsin's dairy plants, according to a report of the Wisconsin Department of Agriculture. The state's production last year was 17,000,000 pounds, and is absorbed mostly by the paper industry for sizing and coating. The use of the product as a plastic is also increasing, and some foreign countries are using it to produce synthetic wool. The largest ranking states besides Wisconsin are California with 8,698,000 pounds annually, and New York with 7,700,000 pounds.

Committee To Investigate Stream Pollution

Appointment of a technical committee will be the next step among Wisconsin paper manufacturers to investigate methods of ending pollution of the Fox and Wisconsin Rivers by sulphite liquor. J. M. Con-

way, president and general manager of Hoberg Paper Mills, Inc., Green Bay, and chairman of the executive committee of Wisconsin sulphite pulp manufacturers, announced that each of the twelve mills affected will be asked to appoint to this committee one of its laboratory staff.

This technical committee's task will be to confer with all agencies interested in sulphite waste pollution; the Wisconsin State Board of Health; the Wisconsin Conservation Commission, and the United States Forest Products Laboratory at Madison, Wis. The committee will then seek data from all other countries in which progress has been made.

Former Island Paper Mill Razed

With the blasting down last week of a 165-foot smokestack, razing of the buildings of the former Island Paper Company at Menasha, Wis., is about completed. The dismantling has been in progress since last April. The present owner is the Meade Paper Corporation of Chillicothe, Ohio. The Island Paper Company was established in the early seventies by C. W. Howard, and was taken over in 1904 by the late John Strange. After operating the mill for a year, he disposed of it to A. N. Strange and D. T. MacKinnon. The mill became idle after the death of A. N. Strange, and in 1925 was taken over by N. E. Brokaw, who operated it for a time in the manufacture of corrugated paper. Prior to that time it produced manila wrappings, and water and dry finished fiber. The mill was later taken over by the Meade Corporation, and it was decided this year to raze it.

Forest Plantings Increased By 18,000 Acres

Forest plantations in Wisconsin were increased nearly 18,000 acres this year, according to a report issued by the Wisconsin Conservation Commission. The year's planting efforts involved 30,000,000 nursery produced seedlings, mostly of coniferous varieties suitable for augmenting the pulpwood supply. These included Norway, Jack and white pine and white spruce. State forests accounted for 4,640,536 trees, and county forests for 17,079,462. The remainder was largely plantings on private property.

Neenah Co. To Give Christmas Party

The Neenah Paper Company, Neenah, Wis., will entertain its employes at a Christmas party Saturday evening, December 23, at Valley Inn, Neenah, with D. K. Brown, vice-president and general manager serving as host. There is to be a dinner and entertainment program.

Children of employees will be entertained at a party in the afternoon.

Sensenbrenner and Hanson Nuptials

William G. Sensenbrenner of Menasha, Wis., and Miss Mariam Taber, Neenah, Wis., were married December 7 at the parsonage of St. Mary's church at Menasha. Mr. Sensenbrenner is employed at the Lakeview mill of Kimberly-Clark Corporation at Neenah.

Vernon Hanson, of the engineering staff of Kimberly-Clark Corporation, Neenah, Wis., and Miss Dorothy Pinkowsky of Clintonville, Wis., were married last week at Clintonville. They are spending their honeymoon in Florida and will reside after January 1st at 114 N. Commercial St., Neenah.

Reservoir Aids Paper Mills

GLENS FALLS, N. Y., December 11, 1939—About sixty-five per cent of the water that has been turning industries along the upper Hudson and aiding navigation since early summer has been coming from the Sacandaga River. It was also announced this week that approximately 1,000,000 gallons of water a day have been released from the reservoir during the past few months of almost unbroken drouth. Many of the large paper mills, such as the International Paper Company, Corinth, Finch, Pruyn & Co., Glens Falls, and West Virginia Pulp and Paper Company, Mechanicville, depend on the river and the majority of paper mills for several months have been on full time operating schedules with employment running above 3,000 persons. The drouth, greatest in the history of the reservoir, has lowered the water level over twenty feet in the giant basin back of the dam. Heavily laden pulp wood vessels might also have been delayed entering the Port of Albany because of the difference in the harbor level due to the decreased flow from the upper river except for the supply from the reservoir. The reservoir was constructed by the Hudson River Regulating Board at a cost of about $12,000,000 and has already proven of great value to industries in Northern New York.

Several corporations in Washington county were taxed for the cost and maintenance of the reservoir at a meeting this week, the levies being for the year. For the cost, United Paperboard Company, $8,724.93; Fort Miller Pulp and Paper Company, $5,379.48; International Hydro-Electric Corporation, $1,980.50; Union Bag and Paper Corporation, which has two sites, $35,729.40. For the maintenance and operation of the reservoir, United Paperboard Company, $1,630; Fort Miller Pulp and Paper Company, $1,005; International Hydro-Electric Corporation, $370 and the Union Bag and Paper Power Corporation $6,675 and $1,736.25.

Employees Awarded Service Pins

CARTHAGE, N. Y., December 18, 1939—The awarding of service pins to employees of the National Paper Products company, a subsidiary of the Crown-Zellerbach corporation, took place recently at an annual banquet held in the Levis Hotel Grill.

A. B. Lowenstein of San Francisco, Cal., vice president of the corporation, presented pins to 48 employees. Pins are awarded at five-year intervals for continuous employment with the company. A 90-day lapse in employment constitutes a break in service.

The highest award of the evening, a pin for 25 years' service, went to James Copley. There were twelve pins awarded for 20 years' service, twelve for 15 years, nine for ten years and 14 for five years.

F. E. Naber Goes With Gager Lime Co.

Frank E. Naber Jr. has resigned as sales manager of the Protein Division of the Glidden Company to accept the position of general manager of the Gager Lime Company, Sherwood, Tenn.

The Gager Lime Company has a capacity of approximately 25,000 tons of chemical lime, is situated in the heart of the TVA zone, and is an important supplier of lime to the chemical plants and kraft paper mills in the South.

Strong Demand for Paper Expected in 1940

Chicago Market Shows Slight Decline In Week But Paper Merchants Are Optimistic of Future and Look For Good Business Next Year—Raw Material Markets Active and Current Demand Continues — Other News.

[FROM OUR REGULAR CORRESPONDENT]

CHICAGO, Ill., December 11, 1939—The Chicago paper market showed slightly less activity this week than in the past seven days. It is reported that buyers are curtailing commitments, partially because of the approach of inventory season, and partly to "catch their breath" and estimate the near future. There is no lessening of the local opinion that the market in virtually all grades of paper is likely to be strong next year and Chicago paper representatives are quite certain that this strengthening will appear in an upward revision of prices.

The raw materials market continues to have a buoyant effect on krafts which, locally, are in good demand. Groundwoods are also experiencing good buying and the newsprint market is responding to a combination of the pulp situation and improved advertising lineage. Bonds and ledgers are steady though not so active as last week with all grades of sulphites still with a firm undertone. Specialties in demand prior to holiday season reflected the general optimism over an improved retail business. Books and covers were steady to strong and waste papers likewise maintained the strength of the past few weeks.

Paper Community Fund Nears End

The paper Committee of the Community Fund of Chicago, now nearing the end of the current drive for funds to help finance Chicago's charitable institutions, is reported to be doing a good job. Headed by A. G. Ballenberg, treasurer of the Morris Paper Mills, and Leo S. Altholz, Inlander-Steindler Company, the many "workers" have secured a total of $21,000 toward the quota of $30,000. The drive will continue until the quota is reached. Of genuine interest is the fact that in past years the paper division has been much further away from its goal at this time than is the case in the current drive. Goals have not been reached until January, February and sometimes March but it looks as though the quota would now be reached in late December. The $3,611,000 fund for the entire drive is just $450,000 short of the goal at the present time with a "check-up" meeting scheduled for December 20. Included in the group of paper executives working on the drive are A. G. Shannon, H. S. Eckhaus, M. G. Fessenden, R. W. Darnell, E. J. Loewenthal, W. W. Goldberg, George K. Gibson, F. W. Randolph, Logan W. Miller and T. F. Woody.

Paper Trade Interested in Packaging Contest

Several Chicago entries are expected in the fifth annual competition for the Wolf Retail Award for the most effective packaging, a contest sponsored by the National Retail Dry Goods Association. The package must have been designed by or expressly for a retail store and actually used for the first time in 1939. Winning awards will be exhibited at the N.R.D.G.A. meetings in January. The paper industry is taking an active interest in the contest which draws national attention to efforts to use color, to award redesigning, convenience and continuity of a group of packages. The trophy is awarded annually by Irwin D. Wolf, vice president of Kaufmann Department Stores and chairman of the packaging committee of the N.R.D.G.A.

Employment Stable in Paper Mills

During the first nine months of this year, the paper industry maintained the most stable employment of any Wisconsin group, according to reports of the Wisconsin Industrial Commission. This is shown by statistics on unemployment compensation benefits paid out. The average payment from January to September was $10.36, but for the paper industry it was $9.85, the report showed. During the nine-month period, a total of 315,146 employees received benefits for total or partial unemployment totalling $2,912,965. Neenah and Menasha, heaviest centers of the paper industry, were among the lowest in the Fox River Valley.

Clifton A. Crocker Dead

Clifton A. Crocker, president of the Crocker McElwain Company and president of the Chemical Paper Manufacturing Company, Holyoke, Mass., died December 14 in his office at the age of 82. He was born in Lawrence, the third son of Samuel S. Crocker. In 1865 his parents moved to Leominster, where he was educated. On leaving school he entered the offices of the Crocker Paper Mill here, in which his father was interested, and in 1887 he was made treasurer.

When the American Writing Paper Company and the Crocker mill merged he was made purchasing agent and remained with the American Writing Paper Company until 1904. Then he started the Crocker McElwain Paper Mill with his brother-in-law, R. Franklin McElwain, and in 1913 bought the Chemical Paper Manufacturing Co.

He was a director of the Springfield National Bank, a trustee of the Springfield College and for several years a member of the Springfield Water Commission. A daughter, Mrs. Joseph E. Holmes, survives.

Improve Dam at Fort Edward

FORT EDWARD, N. Y., December 11, 1939—Improvements have been made to the dam at the plant of the International Paper Company, where two large breaks were fixed. A crew labored day and night for several weeks in order to speed up the work. It is understood that a large mat was placed along the back of the dam and sand bags placed upon it. The dam has shown a number of leaks in past years which have been repaired as they appeared. The improvements are expected to greatly strengthen the structure and place it in first class condition.

Financial News of Pulp and Paper Industry

Scott Paper Sales Increase 12 Per Cent — International Cellucotton and Whitaker Declare Dividends — G. W. Pepper Elected Treasurer — Newsprint Position Strengthens — Bowaters Sells $2,500,000 Issue.

New York Stock Exchange

High, Low and Last for the Week Ending December 20, 1939

	High	Low	Last
A. P. W.	2⅝	2½	2⅝
Armstrong Cork Co.	38¾	37	37⅝
Celotex Corp.	10⅞	10⅜	10⅜
Celotex Corp., pf.	62½	60	60
Certain-Teed Products Corp.	7	6¼	6¼
Certain-Teed Products Corp., pf.	32	29¾	27¾
Champion Paper & Fibre Co.	26½	24	25½
Congoleum-Nairn Co.	23¼	22	22¼
Container Corp. of America	16⅞	16	16½
Continental-Diamond Fibre Co.	7⅜	6⅝	7⅜
Crown-Zellerbach Co.	17⅜	17⅛	17½
Crown-Zellerbach Co., pf.	94	91	92
Flintkote Co.	21¼	20⅛	20⅛
Robert Gair	3¾	3½	3⅝
Robert Gair, pf.	16⅛	16	16
International Paper & Power	14⅛	13¼	14⅛
International Paper & Power, pf.	57¼	50⅜	56¾
Johns-Manville Corp.	76½	74	74¾
Kimberly Clark Corp.	36½	34⅝	36½
MacAndrews & Forbes	32¾	31½	32¾
Masonite Corp.	38	37½	37⅝
Mead Corp.	11½	11	11½
Mead Corp., pf.	70	70	70
Paraffine Companies, Inc.	44	43½	44
Paraffine Companies, Inc., pf.	100	99½	100
Rayonier, Inc.	17	16½	17
Rayonier, Inc., pf.	28¾	28	28⅜
Ruberoid Co.	19½	18¼	18⅜
Scott Paper Co.	47⅜	46	47¼
Sutherland Paper Co.	28	27⅛	28
Union Bag & Paper Corp.	12⅞	12	12⅞
United Paperboard Co.	5½	5⅜	5½
U. S. Gypsum Co.	88½	86	87
U. S. Gypsum Co., pf.	172	172	176

New York Curb Exchange

High, Low and Last for the Week Ending December 20, 1939

	High	Low	Last
American Box Board Co.	8	8	8
Brown Co., pf.	29¼	28¼	29¼
Great Northern Paper	42½	41	42½
St. Regis Paper Co.	3¼	3	3¼
St. Regis Paper Co., pf.	56¾	52¼	56¾
Taggart Corp.	6¾	5¾	6

Cellucotton Votes Extra Dividend

[FROM OUR REGULAR CORRESPONDENT]

NEENAH, Wis., December 18, 1939—Directors of the International Cellucotton Products Company last week voted an extra dividend of one dollar per share, payable December 26 to stock as of record December 14. The regular dividend of 37½ cents per share also was voted, payable January 2 to stock of record December 20. Payments for the year will total $3, compared with $2.25 in 1937 and 1938. The company markets the sanitary specialties of Kimberly-Clark Corporation's mills.

Scott Paper Sales Up 12 Per Cent

Sales of Scott Paper Company, Chester, Pa., for 11 months, 1939, amounted to $16,726,208, an increase of 12.4 per cent over the corresponding period of 1938, Thomas B. McCabe, president, announced to shareholders of the company.

Sales shipped in November were 27 per cent higher than November, 1938. Production for the month established a new high record, reflecting the substantial capital additions and improvements made during recent months together with more efficient operation of the plant as a whole.

G. W. Pepper To Be Treasurer

The board of directors of Scott Paper Company, Chester, Pa., announces that it intends to fill, on or about January 1, 1940, the vacancy in its membership and the vacancy in the office of treasurer of the company by the election of G. Willing Pepper, now a partner in the investment banking firm of Smith, Barney & Co. In order to accept the office of treasurer and membership on the company's board of directors, Mr. Pepper plans to resign as a partner of Smith, Barney & Co. effective on or about January 1, 1940.

The board also announces the election of William F. Mohan as first vice president, Raymond C. Mateer, formerly vice president in charge of purchases, as vice president and William S. Campbell, formerly secretary of the company, to the office of vice president. William R. Scott, 3d, head of the legal department, was elected to fill the office of secretary of the company.

The other officers of the company are Thomas B. McCabe, president; William M. Carney, controller; John B. Hay, assistant secretary; J. C. R. Whiteley, assistant treasurer, and Francis W. Plowman, assistant controller.

Strengthens Newsprint Position

WASHINGTON, D. C., December 20, 1939—The disruption of world newsprint markets, emphasizes a strong Canadian position in this field. Undoubtedly this country's newsprint industry stands to benefit by the redistribution of markets. A marked improvement in the earning prospects of Canadian newsprint producers is already evident. The rise in value of the American dollar to a premium of 10 per cent thus far has been the most important factor. It should be remembered that the Canadian newsprint producer quotes in American dollars, the official price today being $50 per ton. This increase will, if maintained, raise proportionate earnings for security holders more sharply than the contemplated increase in gross revenues.

Bowaters Bond Issue Sold

MONTREAL, Que., December 18, 1939—It is understood that Dominion Securities Corporation and Collier, Norris & Henderson have purchased an issue of $2,500,000 Bowater's Newfoundland Pulp & Paper Mills Limited first mortgage 5 per cent bonds due 1968.

Whitaker Votes $1 Dividend

The Whitaker Paper Company has ordered a dividend of $1 a share, payable December 27 to shareholders of record December 16. This brings its 1939 payments to $3, against $4 paid last year.

Government Paper Bids and Awards

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., December 20, 1939—Marquette Paper Company has been awarded the contract for furnishing the Government Printing Office with 172,250 pounds of 34 x 48 white sulphite bond paper at 5.78 cents. Mudge Paper Company will furnish 19,890 pounds (90,000 sheets) of 40½ x 42½, 50 per cent rag, lithograph finish map paper at 10.14 cents. Bids for these items were received on November 24.

Other paper awards announced by the Printing Office include;

Cauthorne Paper Company will furnish 42,000 pounds (500,000 sheets) of green mimeograph paper at 5.5 cents and Barton, Duer & Koch Paper Company will furnish 5,000 pounds (200,000 sheets) of 100 per cent rag, 21 x 32 white manifold paper at 27.5 cents. Bids for these items were received on November 22.

Walker, Goulard Plehn Company will furnish 23,000 pounds (200,000 sheets) of 21 x 32 white ledger paper at 6 cents, bids for which were received on November 20. Same firm will also furnish 23,400 pounds (150,000 sheets) of 24 x 38 white sulphite ledger paper at 6 cents, bids for which were received November 17.

Marquette Paper Company will furnish 160,000 pounds (1,000,000 sheets) of 34 x 44 white sulphite bond paper at 5.72 cents, bids for which were received on November 15. Barton, Duer & Koch Company will furnish 10,000 pounds of 26 x 38 strawboard at 5.3 cents.

The Printing Office has received the following bids for 40,000 pounds of yellow sulphite writing paper in 30″ rolls; Whitaker Paper Company, 5.84 cents; Perkins Goodwin Company, 5.57 cents; Old Dominion Paper Company, 6.128 cents; Marquette Paper Company, 6.14 cents; Stanford Paper Company, 6.5 cents; Barton, Duer & Koch Paper Company, 5.48 cents; and R. P. Andrews Paper Company, 5.87 cents.

For 71,755 pounds (500,000 sheets) of 32 x 42 white sulphite bond paper; Barton, Duer & Koch Paper Company, 5.67 cents; R. P. Andrews Paper Company, 5.94 cents; Old Dominion Paper Company, 6.14 cents; Mudge Paper Company, 5.88 cents; Marquette Paper Company, 5.74 cents; Stanford Paper Company, 5.67 cents; Aetna Paper Company, 6.82 cents; and Walker, Goulard Plehn Company, 6 cents less 2 per cent.

For 25,000 pounds (9,000 sheets) of 25 x 30 binder's board; R. P. Andrews Paper Company, 3.75 cents; Barton, Duer & Koch Paper Company, 4.077 cents; Resolute Paper Products Company, 5.9 cents less 2 per cent; and Mathers-Lamm Paper Company, 3.66 cents.

For 44,400 pounds (150,000 sheets) of 24 x 38 H. F. sulphite manila tag board; Paper Corp. of U. S., 5.75 cents; Old Dominion Paper Company, 5.93 cents; R. P. Andrews Paper Company, 5.45 cents; Whitaker Paper Company, 5.875 cents; Mudge Paper Company, 5.86 cents; and Stanford Paper Company, 6.24 cents.

For 40,000 pounds newsprint paper in 24 inch rolls; 120,000 pounds in 36 inch rolls; and 200,000 pounds in 48 inch rolls; National Pulp and Paper Company, 2.5 cents; Paper Corporation of U. S., 3.25 cents; and Old Dominion Paper Company, 3.2833 cents.

For 100,000 sheets of 24 x 33 white gummed paper; Virginia Paper Company, $9.85 per M sheets; Mudge Paper Company, $10.97; Stanford Paper Company, $12.00 and $11.25; R. P. Andrews Paper Company, $11.44; Barton, Duer & Koch Paper Company, $11.60; Enterprise Paper Company, $12.028 less 2 per cent; Old Dominion Paper Company, $9.98; and Mathers-Lamm Paper Company, $12.40 and $11.20.

Kiefer Mills Complete Modernization

ERWING, Ind., December 18, 1939—The Kieffer Paper Mills have practically completed their modernization program started in 1938 by installing their own generating plant and individual motors for driving their paper machines, beaters, Jordans, pumps, etc. All of this work was done while the mill was in operation and the change over to the modern electric way has worked out to the entire satisfaction of the company as well as the employees.

The company now has the largest pay roll in its history of thirty-five years and is operating full capacity, five days per week with orders to keep full operation into January. Their entire line of Shoksorb products such as Shoksorb Egg Flats, Brick Trays, Furniture Pads, Box Liners, Basket Circles, Car Door Post Protectors, etc., are having steadily increasing sales and the company looks forward to the New Year with confidence.

The company also recently bought additional real-estate adjoining their plant and expect shortly to build a modern brick and concrete addition to their present plant, all to conform to the present plant, making a total floor space of 40,000 square feet. The addition will be used for converting purposes and additional warehouse space for their various papers and finished Shoksorb products.

The company will again, this year, pay a Christmas bonus to persons who have been in their employ over one year, of 4 per cent of their annual wages amounting to approximately two weeks pay; also they will present each of their seventy-five employees with the usual two pound box of chocolate bonbons.

Foote Bros. Changes

Foote Brothers Gear and Machine Corporation of Chicago, announces that F. H. Fowler, president and general manager tendered his resignation effective December 9, 1939 to accept a position as assistant to the president, and chief operating executive of the American Machine and Metals Inc., of Moline, Ill. and New York. Mr. Fowler will continue as a director and chairman of the executive committee of Foote Brothers Gear and Machine Corporation. W. A. Barr, vice president in charge of manufacturing of Foote Brothers has been elected executive vice president and general manager by the board of directors. F. A. Emmons, vice president in charge of sales and J. R. Fagan, secretary and treasurer, continue in their present offices.

A New Trend in Disc Refiners

By Bruce Armstrong[1]

Disc refiners for grinding screen rejects and for reducing chips to a pulp suitable for wall board and kraft products have a well established place in the paper making industry.

The double disc type refiner which has two rotating heads that operate in opposite directions has been most widely used. The trend lately, however, has been toward single disc refiners, as illustrated by Fig. 1. This type has only one rotating head fitted with removable discs that operate against stationary removable discs attached to the refiner shell.

Explanation of the Trend

Why the trend toward the single disc refiner? First, it is possible to design and build this type with features that permit more accurate control, hence making its adaptation to the problem of refining bundles of fiber reducing the freeness, increasing the mullen, or for breaking down lumps in de-inked stock more practical and desirable.

Second, the single disc construction permits unobstructed entry of stock to the grinding discs as Fig. 2 shows; it eliminates the necessity for seal rings at feed-in point; it lessens the number of wearing parts and because of these advantages does more work with less upkeep expense, less horsepower, less choke-ups and less operating difficulties.

Closer Control

Closer control has been made practical in the single disc refiner because it has been possible to design it so that the rotating elements maintain an absolute parallelism with the fixed element under all operating conditions. This is achieved by locating the center of gravity of the rotating system on the plane of rotation.

Wider application is feasible because it is now possible to design plates for the service involved. With advance knowledge of the tonnage to be handled, the consistency, the cutting length required for the duty to be performed (or the area of contact when it is desired to secure a hydration effect), the physical characteristics of the feed, and the desired characteristics of the finished stock, it is possible to figure with precision the correct plate design to give the most economical results.

Other Details

Other details of interest to the practical operator are the adjustment features that permit the movement in or out of the rotating disc while the mill is in motion thus altering the distance between the fixed and moving grinding plates to accommodate a change in feed or to slightly alter the characteristics of the finished stock.

A lantern-ring gland where the shaft passes through the shell prevents acid or caustic solutions working along shaft and possibly getting into the bearings.

Direct connected motors, usually of splash-proof type, are built into the unit, thus avoiding any belt pull that might cause shaft deflection and consequent deflection of the grinding elements, and at the same time providing the maximum amount of useful power for actual work on the stock.

Space, a very important consideration in many mills, is conserved by the compact and rugged construction.

To operators interested in keeping fully informed on refining equipment developments, we recommend investigation of this new trend toward single disc refiners.

[1] Sprout, Waldron & Co., Muncy, Pa.

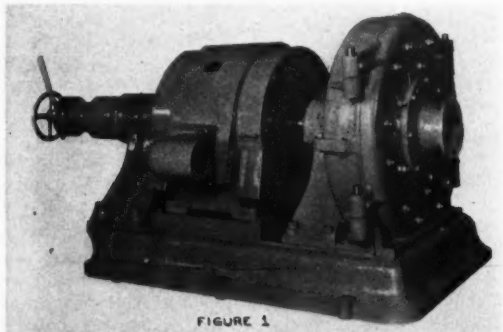


FIGURE 1

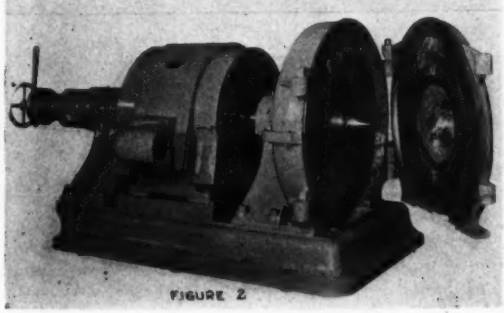


FIGURE 2

Piermont Mill Gets Plaque

On December 18, 1939, Norman F. Greenway, vice-president and general manager, presented, on behalf of Robert Gair Company, Inc. to the Piermont Paperboard Mill, a bronze plaque for its record in running 500,000 man hours without a lost-time accident. Mr. Dennis Hogan, superintendent of the Mill, accepted the plaque on behalf of the mill employees. The mill was run from January 3, 1939 to December 9, 1939 (record still unbroken) without a lost-time accident, with an average employment of approximately 250 men. The plaque reads as follows:

"Presented in Appreciation by Robert Gair Company, Inc. to the Employees of its Gair Cartons Division Paper Mill for an Outstanding Achievement in the Elimination of Suffering, by Working One-Half Million Man Hours, from January 3, 1939 to December 9, 1939, without a Lost-Time Accident, Under the Direction and Guidance of:

Harry Van Decker, Division Manager; Edmund Moore, Personnel Manager; Dennis Hogan, Superintendent; Thomas Crean, Chief Engineer; Thomas Sedlach, Tour Boss; George Cuff, Tour Boss; Frank Toomey, Tour Boss.

Waste Disposal Committee Meets

The annual meeting of the Advisory Committee on Waste Disposal of the Wisconsin Pulp and Paper Industry was held in Madison, Wis., on November 17, 1939. Representatives of various Wisconsin mills, state officials, and state and federal laboratories attended.

In general, water conditions during the summer of 1939 were relatively favorable. Only for very short periods were critical conditions found on the Flambeau River below Pixley Dam and on the Lower Fox River below Wrightstown. The summer was, however, characterized by excessive algae growth in most of the waters of the state, causing a great deal of trouble in operation of mills and in numerous cases resulting in the death of fish.

Conditions in East River

A major project undertaken in the state jointly by the State Board of Health and the Green Bay Metropolitan Sewerage Commission was an extensive survey of water conditions in the East River, at the mouth of the Fox River and in Green Bay. The adverse condition that caused this survey to be made was the fact that waste sulphite liquor from one of the mills is discharged into the East River which is a stream of such a low rate of flow that it is practically stagnant and under certain wind conditions will even flow upstream. It was established that the soluble carbohydrates from the waste sulphite liquor supply energy to bacteria present in the water of the East River and these in turn break down sulphur compounds in the waste sulphite liquor causing the production of hydrogen sulphide, the bad odors accompanying this gas and an anaerobic condition in the waters of the East River. Preliminary remedial steps, agreed upon by the mill and the state authorities, are now being engineered.

Waste Sulphite Liquor Problem

The various and numerous methods of meeting the waste sulphite liquor pulp problem were discussed in detail to the end of attempting to evaluate these methods. These methods included the Howard process, the Tomlinson process, evaporation and burning, utilization as binder, hydrogenation, plastics, and other less well-known uses. A heat balance test using lignin fuel from the Howard process had been completed in 1939 and its interpretation was covered. The use of trickling filters and of activated sludge treatment for the Howard process effluent from waste sulphite liquor was discussed. In view of the fact that a new committee is in process of being appointed to deal exclusively with this waste sulphite liquor problem, the interpretation of tests so far made, and the economic balance of the various processes proposed, will be held up and turned over to the new committee for its guidance.

Sulphite Executives Organize

A committee of executives of sulphite mills in the state of Wisconsin had been organized on November 14, which committee had already assessed themselves ten cents per ton of annual production for five years to be expended on abatement of waste sulphite liquor stream pollution. This committee of executives will appoint a technical committee to recommend types of research work and assign research work to state, federal and private laboratories at the discretion of the committee of executives. The functioning and the scope of activity of the present Advisory Committee and the new technical committee to be appointed will be decided after organization of the new committee is completed.

Sewer Losses

The results of the 1939 Wisconsin mill survey showed that the sewer losses from the various mills in the state were substantially the same as for last year. There seems to be a tendency for the use of less water, and the volume of wastes showed a decrease; but the concentration of wastes, particularly of fixed suspended solids such as clay, showed an increase. Continuance of control stations, mill surveys and the general cooperative program of the state and the industry were voted for 1940.

Slower Demand in Indianapolis

[FROM OUR REGULAR CORRESPONDENT]

INDIANAPOLIS, Ind., December 18, 1939—Demand for the better grades of paper has slowed considerably here in the last week, but conditions, according to local jobbers are not out of line with those in most other sections of the country. Demand is better than it was a year ago and for that they are thankful. In spite of a lessened demand prices on all grades of fine paper are extremely firm and it is predicted here that price rises can be expected before the first of the year. Everybody here seems to be looking for a good business the first quarter of the coming year. The situation in the envelope trade is about the same as in fine papers. The local trade is bending every effort now toward bringing warehouse stocks down prior to inventory and at the same time maintain balanced stocks.

The newsprint demand continued heavy the last week with holiday advertising going into high and lineage increasing. Thus far there appears to be no difficulty in getting orders filled in spite of the European situation.

A slight reduction was reported this week in most of the container field and little change is expected before the first of the year. Prices are well maintained, however, and local executives believe the first of the year will see the trade off to a good start. Kraft continues about the same. Due to the season, the demand for wrapping paper and bags has jumped decidedly. This unusual demand is expected to continue right up until the end of the present week. Prices are slightly higher than they were, but the increase is not marked.

Virtually nothing new is seen in the building paper demand, which continues slow with no prospect of betterment until sometime in January.

Dealer stocks are low and likely will be replenished the last of next month in preparation for the coming building season.

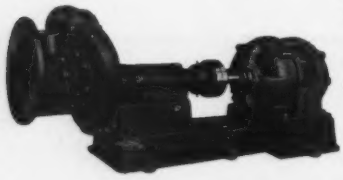
The paper stock situation is unchanged. All prices on better grades are firm, but mill demand is slow. The rag market is rather slow with no price changes, with a firm market.

BELOIT IRON WORKS

BELOIT WISCONSIN

"ST-P" Stock Pump

A large clearance, heavy duty stock pump guaranteed by the manufacturer to be non-binding has been developed by Morris Machine Works, builders of pulp and paper mill pumps since 1864. The suction nozzle of this pump is unusually large for the pump capacity, with specially proportioned gradation of cross sectional areas so that high consistency stock can be given access into the impeller without choking. An enlosed parallel shrouded impeller is provided, with external wiping vanes on both surfaces to keep clear the passages between the impeller and the casing.



A propelling device known as a suction booster can be installed in the suction nozzle to prevent dehydration of extremely high consistency stock. The suction shroud of the impeller is designed to create a hydraulic seal which effectively prevents internal leakage from the pressure passages to the suction.

Air binding is prevented by a vent in the highest part of the suction nozzle, also by the horizontal top discharge nozzle. The pump is diagonally split and equipped with large suction hand hole to provide easy access. The bearings have special provision for convenient shaft adjustment.

These pumps are successfully handling stock for paper machine feed, and have been tested on stock in excess of 6 per cent consistency. The output under varying heads is very nearly constant in spite of the foaming characteristics of some of this stock. They are also handling raw waste paper and rag stock without the wedging of foreign matter between the impeller and the casing. The pumps are built in 3-in. 4-in. 5-in. and 6-in. sizes to handle 15 to 250 tons of paper per day at moderately low operating speed. Additional information on this guaranteed non-binding stock pump, known as the "ST-P" stock pump (patent pending) can be obtained by addressing Morris Machine Works, Baldwinsville, N. Y.

Power Benefits To Brown Corp.

[FROM OUR REGULAR CORRESPONDENT]

MONTREAL, Que., December 18, 1939—Important progress in connection with the developments of the Brown Corporation's pulp mill at La Tuque, Que., are foreshadowed by the news of the past few days. It is announced that the St. Maurice Power Corporation's power enterprise at La Tuque is now in its final stages. The Brown Corporation is joint owner with the Shawinigan Water and Power Company of the St. Maurice Power Corporation, which is now completing three 40,000 h.p. generating units at La Tuque Falls, with a fourth unit to go into operation in January, 1941, and with provision for two more units to follow. The entire output of the power plant has been contracted for by the Brown Corporation, and an option on one-half of the output is held on behalf of the corporation's pulp plant, which is now running at capacity, with an output of 660,000 lbs. per day of sulphate pulp and bleached and unbleached kraft fiber. The Shawinigan Company has agreed to take 25,000 h.p. the first year, and at least 75,000 h.p. each year thereafter, until the total output, less the amount taken by the Brown Corporation, has been accounted for.

The bringing into production of 162,000 h.p. at La Tuque within the coming year will not only place that rapidly growing Upper St. Maurice town in a favored position for industrial expansion, and in particular so far as the needs of the Brown Corporation are concerned, but it will guarantee the Shawinigan system a ready source of additional power to meet any possible requirements for war purposes within the territory served by it.

Coupled with the above news comes the news that final approval has been given by the Securities and Exchange Commission to the complete revised reorganization plan for the Brown Corporation. Only the formal approval by the security holders is now required for the plan to become effective. The Reconstruction Finance Corp., which is advancing $10,000,000 in connection with the reorganization, approved the revised draft some time ago.

Method of Designating Colors

The Inter-Society Color Council, of which TAPPI is a member, has recently announced the publication of its report on Project No. 2 which relates to a method of designating the colors of drugs and chemicals. This report appeared in the September 1939 issue of the Journal of Research of the National Bureal of Standards and is now available in reprint form as Research Paper RP 1239 from the Superintendent of Documents, Government Printing Office, Washington, D. C.

The problem dealt with in this report caused the formation of the Inter-Society Color Council, and was presented to the Council by the U. S. Pharmacopoeial Revision Committee at the first meeting. As originally stated, the problem was "to find a means of designating colors in the U. S. Pharmacopoeia, the National Formulary, and pharmaceutical literature; such designation to be sufficiently broad to be appreciated and usable by science, art, and industry, and sufficiently commonplace to be understood at least in a general way by the whole public."

Committees of the Council have been working on a solution for the past seven years. Kenneth L. Kelly, research associate for the American Pharmaceutical Association, has given his full time to details of the solution during the past three years, working at the National Bureau of Standards under the immediate direction of Dr. Deane B. Judd. In June 1939, the solution reported by Messrs. Judd and Kelly was accepted by letter ballot of the voting delegates of the Inter-Society Color Council. The method is therefore recommended by the Council for designating the colors of drugs and chemicals, and is tentatively suggested for general use. Final action on recommendation for general use will come after Council committees have had an opportunity to study the application of this color naming method to specific fields of color work covered by the interests of member bodies. It is hoped that members of each society will cooperate in studying the general application of this method, in order to provide a standardized and widely accepted method of designating colors. Any comments will be appreciated. They should be forwarded to Deane B. Judd, National Bureau of Standards, Washington, D. C.

C.P.P.A. Technical Section to Meet

The annual meeting of the Technical Section of the Canadian Pulp and Paper Association will be held at the Mount Royal Hotel, January 24-26, 1940.

WEDNESDAY, JANUARY 24.

Business session—10:00 a.m.
Activities of Cellulose Chemistry Division of McGill University by Harold Hibbert.
Twenty-five Years of the Technical Section by J. N. Stephenson.
Luncheon—Speaker to be announced.
GROUNDWOOD SESSION—2:00 P.M.
Effect of Consistency and Temperature in Grinding by I. H. Andrews, Powell River Company.
Groundwood for Sulphite Reduction in News by D. D. Carr-Harris, Anglo-Canadian Pulp and Paper Company.
Influence of White Water in Pulp Testing by R. de Montigny, Forest Products Laboratories.
Relation of Classification to Power in Grinding by D. E. Read.

THURSDAY—JANUARY 25.

SULPHITE SESSION—10:00 A.M.
Digester Circulation and Chip Packing by Leo C. Kelley.
Heat Recovery in Sulphite Mills by H. Mason, Anglo-Canadian Pulp and Paper Company.
Fiber Degradation in Chipping by F. H. Yorsten, Forest Products Laboratories.
Joint Luncheon with the Woodlands Section.
MEETING OF BOARD MANUFACTURERS GROUP—2:00 P.M.
Committee Meetings.

FRIDAY, JANUARY 26—10:00 A.M.

Heat Recovery by Briner Economizers by R. J. Chambers, Anglo-Canadian Pulp and Paper Company.
Bark Burning by K. LeBaron, International Paper Company.
Waste Into Production in Newsprint Operation by F. A. Soy, Price Brothers & Co.
Joint Luncheon with the C.P.P.A.
Control of Slime at Ontario Paper Company by J. M. Forrester and E. G. Kirby, Ontario Paper Company.
Alkaline Pulping by R. Collins, Consolidated Paper Corporation.
Tests for the Printability of Paper by W. B. Beazley, Forest Products Laboratory.
Discussion of Committee Report on Printing Problems.

Spain Concerned About Pulp

WASHINGTON, D. C., November 29, 1939—Spain's dependence upon foreign suppliers of wood pulp, and the inability to secure exchange to permit the importation of stocks sufficient for the domestic paper industry, has been a problem which has occupied the attention of the "Comite Sindical del Papel y del Carton" during the past several months. In addition to a proposal for the reforestation of certain sections of Spain, and the creation of a domestic pulp manufacturing industry, the committee apparently took active steps to arrange for the importation of adequate supplies of pulp, both chemical and mechanical, from the usual North European sources.

FINLAND SUOMI

REPRESENTATIVES IN U. S. A. AND MEXICO

OF THE

FINNISH CELLULOSE ASSOCIATION

HELSINGFORS, FINLAND

FINNISH WOOD PULP UNION

HELSINGFORS, FINLAND

PULP SALES CORPORATION

230 PARK AVENUE

NEW YORK, N. Y.

New England TAPPI Discusses Coating

The New England Section of the Technical Association of the Pulp and Paper Industry met at the Roger Smith Hotel, Holyoke, Mass., December 15, 1939. Randall H. Doughty of the Fitchburg Paper Company presided as chairman.

Election of Officers

The following officers were elected for 1940: Chairman—Randall H. Doughty, Fitchburg Paper Co., Fitchburg, Mass.; vice-president — Norman I. Bearse, Champion International Company, Lawrence, Mass.; secretary — Helen U. Kiely, American Writing Paper Corporation, Holyoke, Mass.; treasurer—Hermon T. Barker, Bird & Son, E. Walpole, Mass.; executive committee — Frederick C. Clark, Newton, Mass.; Roger C. Griffin, Arthur D. Little,, Inc., Cambridge, Mass.; E. O. Reed, Crane & Company, Dalton, Mass.; W. L. Foote, B. F. Perkins & Sons Co., Holyoke, Mass.; Harold Brakewood, National Folding Box Co., New Haven, Conn.; T. L. Stirling, Hercules Powder Co., Holyoke, Mass.; John P. Kennedy, American Writing Paper Corp., Holyoke, Mass.; F. H. Schneider, Hampden Color & Chemical Co., Springfield, Mass.

Papers on Coating

Two papers were presented, one by Norman I. Bearse, Champion International Company, Lawrence, Mass., on "The Manufacture and Properties of Coating Body Stock," and the other by C. G. Albert, Edgar Brothers Company, New York City, on "Particle Size, Make-Down and Preparation of Clays."

Mr. Bearce first outlined the reasons for coating or surfacing paper under the following three general headings. 1. For improved printing surface, 2. For decorative effect, and 3. For special utilities. He reviewed briefly types of coated specialties but as they are not of general interest, emphasis was placed on characteristics necessary, in a body stock as required by most coating mills. Mr. Bearce stated that the most important quality of a coating base stock is "uniformity." Paper that is uniformly off the standard in color, weight, Mullen, fold, tear, sizing is far less troublesome than a lot of paper that varies widely in one or more specifications. Uniformity is more important to the coating mill than to the ultimate consumer of the paper due to the nature of the coating process. Next in importance is sizing as the coating mixture must be absorbed evenly over the sheet and to a degree where it is bound sufficiently but not great enough to prevent leveling or to destroy gloss. Uniformity of color in body stock is very important as most coatings lack opacity and thus the base stock affects the final shade of the coating. Other necessary qualities are lack of fuzz, freedom from dirt, and freedom from curling, as well as other common specifications of any paper in regard to required weight, bulk and strength. Papers coated for a subsequent printing operation require all the above mentioned qualities in addition to necessary levelness of surface, cushion, register, opacity and proper ink absorbtion. Mr. Bearce then reviewed the means and control methods necessary for the paper mill to produce coating body stock to meet the aforementioned qualities. He stressed skill and watchfulness of crew in addition to practical automatic apparatus. In closing he stated that adequate coating equipment and the correct coating color mixture can minimize many of the burdens that fall on the body stock when used on non-modern equipment.

Dr. Albert gave an interesting paper regarding the developments in the selection of various coating clays by determining their particle size. The clay manufacturers are able to supply clays which have been classified within narrow limits by their particle size. He reviewed the methods of making this determination and also the methods used by various coating and paper mills for determining the approximate particle size of the clay. It is admitted that particle size classification does not indicate in any exact way the results which will be obtained by the mill in their coating mixture. Dr. Albert discussed the chemical as well as the physical properties of various clays and noted that particle size determinations are more comparable on clays that are from the same source than on clays from widely varying districts. He also showed various graphs showing particle size variations on different clays. Mention was made of the very interesting research work which has been carried on by Dr. Hauser at M.I.T. on the particle size fractions of various types of clays. Interesting discussions followed both papers.

Among those present were the following: E. O. Nash, C. J. Enemark, P. S. Sinclair, W. L. Foote, R. T. Brigham, J. C. Barthel, F. H. Denham, Richard Penfield, Jr., George E. Fromm, L. N. Smith, E. E. Hazen, W. J. Burke, F. A. Strovink, Chas. I. Horton, Thomas W. Hungerford, Jr., Joseph J. Thomas, C. Russell Shaw, George H. Batchelder, Laurence A. Barker, C. G. Albert, R. H. Doughty, F. H. Lovenberg, Olin W. Callighan, W. A. Nivling, Tom Falkner, T. L. Stirling, H. F. Bigelow, Paul G. Buskey, Fred H. Schneider, G. E. Mangsen, L. W. Crouse, O. W. Messner, P. S. Barnhart, T. J. Flaherty, A. F. Bailey, Harry Duston, H. L. Mellen, Robert Mannheim, Claude H. Smith, P. W. McPherson, N. I. Bearse, Helen U. Kiely, Lena E. Kelley, Edwin Bieniek, John T. Leecock, R. E. Kilty, Andrew Jackson, William Anderson, A. L. Perry, Ralph Kumler, O. F. Hutchinson, James Booth, Herman Otto, George Carroll, Robert Pattison and John P. Kennedy.

May Form New Chicago Association

CHICAGO, Ill., December 18, 1939—Several Chicago wrapping paper merchants attended a meeting at the Stevens Hotel, Chicago, on December 14, for the purpose of discussing organization plans for the formation of a new Chicago Paper Trade Association to be organized as a constituent member of the National Paper Trade Association. Mr. R. H. Ziegler, assistant secretary of the N.P.T.A., outlined a working program and it was decided to hold the next meeting in January, 1940.

Business-Government Contracts

An analysis of the principles and procedures relating to contracts between government and private business, believed to be the first complete study of this important subject, is contained in the combined November-December issue of the National Association of Manufacturers' Law Digest, just released to the membership of the association.

Pointing out that the combined agencies of the Federal government today represent "perhaps the largest purchasing agent" in the American market, the Digest further declares that the necessity for understanding Federal requirements in the matter of contracts is not only increased by the peace-time needs of national defense, but also because of a "growing tendency in recent years to extend such requirements by statute or interpretation to manufacturers and suppliers having no direct contractual relationship with the government." For example, if proposed amendments to the Walsh-Healey Government Contracts Act are adopted, the statute will apply to subcontractors as well as contractors and to contracts involving an amount less than the present $10,000 minimum, and more thousands of manufacturers will be affected thereby.

"It is the purpose of this article to outline briefly the administrative procedure for entering into government supply contracts and the principal legal requirements and consequences of the contractual relationship established," the Digest says. "It is our hope to provide an introduction which will show in a general way what is involved in contractual relations with the government and how more complete information, essential to prospective contractors, may be obtained."

The chief topics treated by the N.A.M. publication were: 1. General principles and procedures on entering into government contracts; 2. Standard contract forms and typical provisions; 3. Laws which may be part of contracts; 4. Procedure for payment; 5. Disputes and appeals; 6. War-time contracts.

C. E. Duerr Joins Potdevin

C. Edward Duerr, formerly connected in a sales capacity with R. Hoe, Goss and Duplex, has joined the sales and service staff of Potdevin Machine Company, manufacturer of paper bag, paper printing and paper coating machinery, Brooklyn, N. Y. As sales representative, Mr. Duerr will specialize upon the recently-perfected multi-size, multi-color, roll-to-roll and roll-to-sheet presses of Potdevin make including letter-press, aniline and gravure process.

Mr. Duerr has been associated with the printing press machinery industry for more than nineteen years, during which time he has had practical machine-shop and printing operation experience, and has been engaged as a sales representative in that field for many years. He received a degree in mechanical drafting at Mechanic's Institute and attended New York University.

Hold Regional Conference

CHICAGO, Ill., December 18, 1939—A Midwest Regional Conference was held at the Stevens Hotel, Chicago, on Tuesday, December 12. Representatives from five local associations were in attendance representing sixteen member houses. An interesting agenda having been prepared, the entire day was devoted to a discussion of current problems in the wholesale paper trade. The most significant discussion centered around the presentation of a recent survey, conducted by the Statistical Research Division of the N.P.T.A., relating to the methods of compensating Outside Salesmen. The following members were in attendance: C. E. Roach, vice-president in charge of the Wrapping Paper Division; J. S. Addison, Service Paper Company, Racine, Wis.; A. J. Funk, Elgin Paper Company, Elgin, Ill.; E. A. Sullivan, Rockford Wholesale Paper Company, Rockford, Ill.; A. R. Sielaff, A. E. Sielaff Paper Company, Milwaukee, Wis.; J. M. Willem, A. E. Sielaff Paper Company, Milwaukee, Wis.; L. J. Marshall, Marshall Paper Company, Appleton, Wis.; T. Floyd Smith, Jr., Louisville Paper Company, Louisville, Ky.; Ira Rohrer, John Wilding Paper Company, Fort Wayne, Indiana; R. R. Epler, Baker Paper Co., Cedar Rapids, Iowa; H. J. Voelker, W. H. Kranz Company, Racine, Wis.; Harry Newton, American Paper Company, Milwaukee, Wis.; R. H. Kurth, Paper Specialty Company, Wausau, Wis.; J. D. Wilson, John C. Streibich Company, Peoria, Ill.; W. B. Roberts, John C. Streibich Company, Peoria, Ill.; D. Z. Hegamaster, The Ohio & Michigan Paper Company, Toledo, Ohio; Bill Chukerman, J. Chukerman & Sons, Chicago, Ill.; R. H. Ziegler, assistant secretary, The National Paper Trade Association.

Meters for Steam Liquids and Gas

A 47-page illustrated bulletin covering the use of flow meters wherever air or gas, liquid or steam is produced and distributed, has just been published by the Foxboro Company, Foxboro, Mass. The booklet contains an interesting discussion of flow problems encountered in various industries and methods of approach to these problems.

In addition to a complete description of remote measurement and flow control, the bulletin provides data on universal flow meters, pressure compensating meters, bell-type meters, wide-range meter settings, high pressure meters, square root integrators and indicating flow meters.

Construction details contained in the booklet include a diagrammatic representation of the operation of the segmental lever and float, and information concerning automatic check valves, pressure-tight bearings, damping plugs, static pressure movements and electric and spring-wound clocks.

A section devoted to meter accessories is illustrated with charts of uniform flow scale, uniform differential scale and square root scale. Other accessories mentioned are orifice plates, flanges and vanes. Standard ranges are shown, and useful data is given on piping layouts and meter mountings. Copies of the bulletin, No. 200-4, may be obtained by writing The Foxboro Company, Foxboro, Mass.

Construction News of Pulp and Paper Mills

C. A. Reed Mfg. Co. To Build Addition To Plant At Williamsport, Pa. —Rochester Envelope Company Awards Contract For Addition To Plant —New Haven Pulp & Board Co. To Make Additions At New Haven.

Williamsport, Pa.—The C. A. Reed Manufacturing Company, Chestnut street, manufacturer of paper goods, has plans in progress for new addition to plant, to be two-story and basement, 80 x 180 feet, reported to cost over $60,000, with equipment. It is expected to ask bids for general erection at early date. Clarence E. Wagner, 51 West Third street, Williamsport, is architect.

Philadelphia, Pa.—The Roosevelt Paper Stock Company, 908 Callowhill street, general paper products, will begin work soon on alterations and improvements in storage and distributing building, location noted, to replace a fire loss. Structure is owned by Girard Trust Company, South Penn Square, and occupied by company under lease. Bids have been asked for work.

Rochester, N. Y.—The Rochester Envelope Company, 72 Clarissa street, manufacturer of commercial paper products, has awarded general contract to Alexander, Shumway & Utz Company, 80 South Fitzhugh street, Rochester, for new addition to plant, previously referred to in these columns, to be one-story, estimated to cost close to $40,000, with equipment. Erection will be placed in progress at once. New structure will be equipped for considerable increase in present capacity.

Baltimore, Md.—The Maryland Fibre Prodoucts Co., Inc., Frederick avenue and Willard street, manufacturer of fiber specialties, plans early rebuilding of portion of mill recently destroyed by fire. Loss estimated close to $25,000, with equipment. Reconstruction is expected to cost about a like amount.

New Haven, Conn.—The New Haven Pulp and Board Company, 259 East street, manufacturer of paper board products, news board, chip board, etc., has taken out a permit for alterations in plant, and will carry out work at once. No estimate of cost announced.

St. Paul, Minn.—The Minnesota Rag and Paper Stock Company, 243 Starkey street, waste paper stocks, has filed plans for two-story addition, 59 x 67 feet, to storage and distributing building, and will proceed with superstructure at once. Erection will be carried out by day labor.

Yonkers, N. Y.—The Custom-Made Paper Bag Company, Inc., recently organized with capital of 200 shares of stock, no par value, plans operation of a local plant for the manufacture of paper bags and containers of various kinds. New Company is represented by David Learner, 16 Court street, Brooklyn, N. Y., attorney.

Niagara Falls, N. Y.—The American Sales Book Company, Highland avenue, manufacturer of paper goods, has plans under way for new addition to plant, to be one-story, reported to cost close to $45,000, with equipment. Capacity will be increased. Bids are scheduled to be asked on general erection contract early in 1940.

Maryvale, Australia—The Australian Paper Manufacturers, Ltd., Melbourne, Victoria, has recently begun operations at new pulp mill at Maryvale, Victoria, and will step-up production to maximum capacity at early date. The mill is equipped for the manufacture of kraft pulp, using eucalyptus wood as raw material. Company has arranged for large supply of such pulpwood to assure continuous output at mill. Company is affiliated with the Cumberland Paper Board Mills, Ltd., Melbourne.

London, England—Thomas Tait & Sons, Ltd., has completed the installation of additional machinery at its Inverurie Paper Mills, to make possible the production of paper from oat-straw pulp. Under normal conditions, the plant utilizes esparto grass as raw material, and difficulty in securing the latter material in sufficient quantity during wartime has necessitated the change. It is stated that the quality of the finished paper is equal to that when produced with esparto grass.

York, Pa.—The York Felt Mills, Inc., recently organized with capital of $200,000, has begun modernization and improvements in former local plant of the York Paper Manufacturing Company, West Princess street, taken over for a new mill, as lately reported in these columns, and will carry out work by day labor. Company will specialize in the production of building papers and similar heavy paper stocks, deadening felts, etc., and will install machinery and equipment for large capacity. It is expected to have the mill ready for production early in 1940. Morgan S. Blauser is president; Elmer M. Morris, treasurer and Richard M. Budding, secretary.

New Companies

Brooklyn, N. Y.—The Greenpoint Paper Stock Company, Inc., has been organized with capital of 100 shares of stock, no par value, to deal in paper products. New company is headed by Arens, Lyons, Arons & Jobrack, 50 Court street, Brooklyn, attorneys.

Brooklyn, N. Y.—The Arzee Corporation has been chartered with capital of 200 shares of stock, no par value, to deal in paper cartons, bags and kindred stocks. New company is represented by Davidoff & Menzer, 270 Broadway, New York, N. Y., attorneys.

New York, N. Y.—Colonial Envelope Company, Inc., has been incorporated with capital of $15,000, to manufacture and deal in envelopes and other commercial paper products. New company is represented by William Roth, 551 Fifth avenue, New York, attorney.

Rockland, Del.—The Rockland Paper Products Company has been chartered under state laws to manufacture paper products of various kinds, and proposes to operate a mill at Rockland. The incorporators include E. M. Wilhelm and Warren Roberts, Wilmington, Del.; and Harry Preston, Rockland.

Holds Great Future for Paper

VANCOUVER, B. C., December 16, 1939—Andreas Christensen, technical advisor of the B. C. Pulp and Paper Company Limited, Vancouver, recently told members of the Engineering Bureau of the Vancouver Board of Trade that there was a total investment of $65 million in the pulp and paper plants of British Columbia and declared that this was only an augury of a certain and much greater future for this industry. "Today the pulp and paper industry in British Columbia," he declared, "employs 3000 men directly with a payroll of between $13,000 and $14,000 a day and another 1500 are employed in auxiliary services such as logging, transportation and shipping."

Predicting much greater things, because B. C. has not yet got anything like her natural share of the most rapidly developing trade in the world, Mr. Christensen instanced:

"Stocks of timber material unequalled anywhere on the North Pacific Coast. Perfect climatic and shipping facilities and nearby access to all chemicals and other materials which must be imported. An unlimited market in the United States alone, to say nothing of a whole world hungry for both coarse and 'dissolving' pulps for cellophane and rayon and lacquer and all paper products."

"Washington and British Columbia alone could supply one-third of the world demand for pulp. Our timber for pulping purposes is the finest in the whole world and the supply in other countries is rapidly diminishing," he said, coupling this with an implied warning that "utilization and conservation of our timber resources must go hand in hand."

Present forests under existing cutting methods here supply timber for lumber sawing and for pulping and other utilization in about equal quantities. All the sawn part is used and has a ready market, but the pulping so far has been only 13 per cent of the total. That leaves an enormous margin for pulping, he pointed out.

Mr. Christensen suggested that the University of B. C. should engage in intensive research into the uses of the kind of pulp available. "McGill and other places in the East and South are pretty far away," he said, as he told of great progress in research.

"The pulp and paper industry is the number one industry of Canada, but few people realize it. Here in British Columbia it is set for a development that can hardly be measured," he said, as he told of present plants and markets and of the tremendous strides in production in the Pacific Coast states and in the Scandinavian countries.

L. G. Glazier Made Comptroller

BOSTON, Mass., December 18, 1939.—L. G. Glazier, formerly with Jones, McDuffee & Stratton, retailers of china, glass and kitchen equipment, and president for a while of the New England Terminal Company, has become comptroller of the Hollingsworth & Whitney Company. J. L. Madden, of Hollingsworth & Whitney Company, has been made assistant treasurer of the concern.

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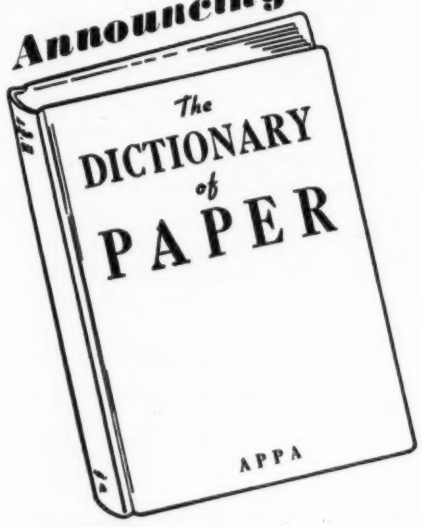

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Editor Technical Section

Lynne M. Lamm
Washington Correspondent

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COMING EVENTS IN PAPER INDUSTRY

NEW ENGLAND SECTION. Technical Association of the Pulp and Paper Industry—Third Friday of each month at the Roger Smith Hotel, Holyoke, Mass.

DELAWARE VALLEY SECTION. Technical Association of the Pulp and Paper Industry—Second Friday of each month at the Engineers Club, Philadelphia, Pa.

LAKE STATES SECTION. Technical Association of the Pulp and Paper Industry—Second Tuesday of each month at the Conway Hotel, Appleton, Wis.

KALAMAZOO VALLEY SECTION. Technical Association of the Pulp and Paper Industry—First Thursday of each month at the Park, American Hotel, Kalamazoo, Mich.

TAXES AND BUSINESS EXPANSION

It is significant that when taxation reaches a high level it acts to retard further recovery and, if persisted in, can block advancement to a higher state of prosperity. The burden of taxes today is exerting a depressing effect on business expansion. This unwelcome sign is seen in the profits reported by American corporations, the trend of which on the whole is downward, while the trend of taxation is upward. Complete recovery is made difficult by this rise in taxation and it explains in part why this country has not made such good progress in recovering from the last depression as in former years.

The explanation is relatively simple. After corporations pay taxes a smaller volume of funds are available, after dividends, to plow back into plant expansion and invest in new equipment. The failure of industry to adequately invest its profits in plant and equipment is cited by some economists as one of the chief reasons why a higher state of recovery has not been reached today. A few figures will serve to explain the significance and importance of business profits in relations to taxes. In 1929, the net income of industry was $8,600,000,000 and it paid out $3,400,000,000 in taxes. In 1936, the income of industry had declined to $4,700,000,000, while corporate taxes rose to $4,100,000,000. In 1937, corporate net income was $4,600,000,000 and taxes had mounted to $4,900,000,000.

These figures from the "Statistics of Income, Bureau of Internal Revenue," show that while industry produced almost as much in 1937 as in 1929, the net income of industry was only a little more than half the total of 1929. It is plain that too large a proportion of the earnings of industry are taken by the Government in taxes. The present unsound fiscal policy of the Roosevelt Administration is, of course, the reason why the Government must increase the burden of taxation. With current expenditures running three times higher than income, higher taxes must be levied if the Administration continues its present wasteful and excessively high spending program. Economy is essential and a very substantial reduction in expenses must be made to strike a balance between income and expenditures. It is expected that the subject of taxation will be the principal subject of discussion when Congress meets next month.

It has been pointed out many times by Government economists that complete recovery is largely dependent upon investments made in plant and equipment. This is normally done through depreciation reserves and out of net income available after payment of taxes. The only alternative is to sell securities to the public, which is a more expensive method of expanding a business. One reason why industry is unable to invest more in plant and equipment is due to the restrictions which the Government has imposed on corporations desiring to borrow from the public. Although depreciation reserves have not been seriously interfered with, the Government placed a special tax on earnings and forced the payment of large dividends in 1936 and 1937, at a time when corporations would otherwise have had substantial profits with which to invest in plants and equipment.

Because of this unwise tax policy adopted by the Administration, through the undistributed profits tax, which was eliminated last year, corporations increased their dividend payments nearly $2,000,000,000 in the years 1936-37, thus eliminating that amount of net income which was available for re-investment in plant and equipment. In any examination of the taxation system on business expansion, it is apparent that corporations as a whole have been unable to save adequately out of net income. In fact deficits have been reported and unsound tax schemes have accentuated this trend. In former years when the burden of taxation was lighter and prior to 1929, except in 1921 which was an unfavorable year, corporations had profits averaging about $2,500,000,000. In other words, corporations during years of reasonable taxes have in the past been able to "prime the pump" effectively but as a unit corporations have been unable to do so since 1929.

As the Federal Government budget is far out of balance and no practical steps have been taken to economize, the trend for higher taxes on corporate income continues. Taxes on payrolls will automatically rise in the future. The present flat tax of 18 per cent on corporations with income above $25,000 is the highest tax yet to be levied on industry. In view of the activities of the Government in checking the retained income of corporations, to make sure

savings are not made to avoid dividends that would be subject to high personal taxes of individual stockholders, it is evident that the present taxation policy can be considerably improved.

As suggested by the Chamber of Commerce of the United States a short time ago, "It is high time for Congress to consider revamping the Federal Budget Act, which has not been changed since it was adopted in 1921. . . . We are in the tenth year of deficits. It is significant to compare this decade of annual deficits, 1931-40, with the preceding decade, 1921-30, which was one of annual surpluses. The revenues were about the same in each period, about forty-one billion dollars. But, in the current ten-year period expenditures will total sixty-eight billions, with deficits of twenty-seven billions, whereas in the preceding decade expenditures were under thirty-four billions and the surplus, from revenues, was eight billions."

Pulp Imports Heavy for October

WASHINGTON, D. C., December 18, 1939—United States imports of woodpulp in October were the highest in volume of any month since October, 1937, according to the Forest Products Division of the Commerce Department.

Preliminary figures set the import total at 216,142 tons, valued at $8,043,538. The October trade was marked by a sharp increase in pulp imports from Norway and Sweden, a substantial increase in imports from Canada and a decrease in imports from Finland, as compared with September.

Finland's wood pulp exports to the United States for October were 15.9 per cent below September shipments. Norway's shipments in October, however, were up 259.5 per cent from September, Sweden's export total was 64.8 per cent higher in October than September and Canada's October export trade was 10.1 per cent higher than in September.

October data of United States woodpulp imports, subject to revision, follow:

Mechanical unbleached, 21,527 tons, of which Finland supplies 753 tons; Sweden, 5,840; Canada, 14,934; and Norway, none.

Unbleached sulphite, 79,397 tons, of which Finland supplied 13,293 tons; Norway, 2,565; Sweden, 38,232; and Canada, 18,060.

Sulphite bleached, 56,398 tons, of which Finland supplied 4,771 tons; Norway, 12,150; Sweden, 7,780; and Canada, 30,864.

Sulphate unbleached, 47,539 tons, of which Finland supplied 8,795 tons; Norway, 393; Sweden, 31,694; and Canada, 5,800.

Soda woodpulp imports into the United States in October amounted to 1,113 tons, all of which came from Canada.

Sulphate bleached, 10,168 tons of which Finland supplied 669 tons; Sweden 5,015; Canada, 4,484; and Norway, nothing.

Charles A. Esty to Visit Coast

BOSTON, Mass., December 18, 1939—Charles A. Esty, president, and P. A. McGreenery, treasurer, both of Carter Rice & Co., Corporation, left Monday, December 4, for the Pacific Coast, planning to visit the coast divisions of the company.

Production Ratio Report

These statistics are based upon paper production reports to the American Paper and Pulp Association.

COMPARATIVE MONTHLY SUMMARIES[1]

Months	1939	1938	1937	1936	1935	1934
January	77.5%	63.9%	90.3%	76.1%	65.8%	.....
February	81.7%	68.7%	90.1%	77.9%	70.0%	.....
March	84.0%	69.6%	90.3%	76.0%	70.5%	.....
April	82.9%	68.3%	92.1%	82.3%	70.0%	.....
May	80.2%	69.0%	90.6%	81.6%	69.4%	.....
June	79.7%	66.0%	87.3%	80.7%	72.3%	.....
July	75.2%	72.0%	81.8%	77.3%	64.9%	.....
August	82.9%	77.2%	82.9%	81.5%	70.9%	.....
September	88.7%	76.3%	78.6%	80.5%	71.9%	58.2%
October	96.6%	82.5%	73.5%	87.6%	75.6%	64.7%
November	97.6%	79.6%	61.9%	88.0%	75.3%	61.7%
December	.....	74.4%	54.5%	85.9%	71.2%	59.6%
Year Average	.....	72.3%	80.6%	81.3%	70.5%	.....
First 49 weeks	84.6%	72.3%	82.5%	81.3%	70.6%	.....

COMPARATIVE WEEKLY SUMMARIES[1]

CURRENT WEEKS, 1939		CORRESPONDING WEEKS, 1938	
November 4	98.0%	November 5	82.4%
November 11	98.1%	November 12	80.9%
November 18	98.4%	November 19	81.6%
November 25	97.3%	November 26	74.4%
December 2	96.0%	December 3	78.8%
December 9	95.7%	December 10	77.6%

The following statistics show the number of mills reporting by ratio groups:

	Number of Mills Reporting—Current Weeks					
Ratio Limits	Nov. 4, 1939	Nov. 11, 1939	Nov. 18, 1939	Nov. 25, 1939	Dec. 2, 1939	Dec. 9, 1939
0% to 50%	31	33	30	38	39	28
51% to 100%	275	273	276	261	240	167
Total Mills Reporting	306	306	306	299	279	195

PAPERBOARD OPERATING RATIOS

Per cents of operation based on "Inch-Hours" reported to the National Paperboard Association.

Year	Jan.	Feb.	Mar.	Apr.	May	June	July
1935	62%	68%	68%	63%	61%	66%	62%
1936	62%	67%	67%	70%	69%	70%	69%
1937	80%	86%	86%	88%	85%	77%	66%
1938	54%	60%	61%	57%	58%	56%	57%
1939	60%	67%	71%	69%	64%	67%	63%

Year	Aug.	Sept.	Oct.	Nov.	Dec.	Year Avg.
1935	67%	71%	77%	71%	61%	66%
1936	75%	78%	82%	80%	74%	72%
1937	74%	69%	65%	55%	45%	73%
1938	66%	66%	70%	65%	59%	61%
1939	72%	74%	84%	....	....	....

Week end. Nov. 4, 1939—84%
Week end. Nov. 11, 1939—84%
Week end. Nov. 18, 1939—83%
Week end. Nov. 25, 1939—78%
Week end. Dec. 2, 1939—78%
Week end. Dec. 9, 1939—79%

[1] Production-capacity ratios are based upon six-day capacity ratings which are adjusted periodically to correspond with the ratings reported by individual companies. Ratios are subject to revision until all reports are received.

Hollingsworth & Whitney Move

[FROM OUR REGULAR CORRESPONDENT]

BOSTON, Mass., December 18, 1939—The Hollingsworth & Whitney Company announced on December 11 the removal of its offices from 140 Federal street to the Public Service Building, 60 Batterymarch street, where on the 14th floor it has capacious, well appointed quarters. The arrangement of the rooms is highly desirable and convenient. The reception room is framed in glass brick and all of the rooms have indirect lighting and insulated ceiling. One room contains large pictures of E. A. Hollingsworth and L. Whitney, beneath which are the respective desks which were used by them. The offices of the executives are particularly attractive, that of President M. L. Madden affording a splendid view of Boston Harbor. There is an ample directors room. The general offices are now all concentrated in one large room.

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Section of the
Technical Association of the Pulp and Paper Industry

Edited by Ronald G. Macdonald, Secretary

Bleaching Procedure Design For High White High Strength Kraft Pulps*

By Warren A. Chilson[1]

Abstract

A procedure for high white, high strength kraft is developed step by step from a fundamental three stage procedure involving chlorination, caustic extraction and hypochlorite. The advantages and disadvantages of combining chlorination and hypochlorite reactions are discussed. Also, the use of batch and continuous methods are evaluated for the fundamental stages.

The planning of a bleaching procedure for high white, high strength kraft offers a wide variety of interesting problems. Research investigators and operators of commercial bleacheries have suggested many bleaching ideas from which to choose. They have recommended many ways in which bleaching steps may be carried out and they have drawn attention to the existence of many factors which affect the economical operation of bleacheries. There is no single bleaching process which can be prescribed for all mills. The procedures must be chosen and designed to meet the particular requirements and limitations of each mill if the desired results as to quality are to be obtained at the lowest possible cost.

In planning a bleaching procedure for the production of a pulp of a high degree of whiteness and possessing a large percentage of the strength characteristics of the unbleached pulp, the first questions which normally present themselves for consideration are: What bleaching steps shall be employed? How many steps shall be used? How shall these steps be arranged?

Fundamental Reactions

Common knowledge of kraft bleaching and of chemical costs dictates the use of three reactions as fundamental for the bleaching of kraft pulps to shades of high whiteness. These reactions in the order of their use are chlorination, caustic extraction and oxidation by hypochlorite. These three form the basis for most of the kraft bleacheries making the higher grade products.

Conditions of Reactions

Forcing the chlorination and caustic extraction steps in order to remove the greatest percentage of impurities has been found to be, within limits, highly desirable. Forcing the last step, hypochlorite, on the other hand, has been found to be detrimental to pulp quality.

During chlorination a part of the chlorine exists as hypochlorous acid, a stronger oxidizing agent than either calcium or sodium hypochlorite. Under conditions of acidity normally encountered during continuous commercial chlorination, the quantity of this material is not sufficient to affect pulp strength unless long periods of reaction are employed. Under conditions of less acidity, the chlorine is converted to hypochlorous acid in increasing proportions until a pH somewhat below the neutral point is reached. Beyond that point, as the acidity disappears and the alkalinity increases, the hypochlorous acid concentration becomes progressively less. The most favorable conditions for chlorination are, therefore, a low pH and a relatively short reaction period. High concentration of chlorine may be employed with no harmful effects, provided the pH is sufficiently low and the reaction is of short enough duration to prevent oxidation of the cellulose.

Forcing the chlorination has been found to be very effective and highly desirable. Forcing the caustic extraction on the other hand, has its limitations as regards papermaking pulps. Increasing the severity of the caustic extraction beyond a certain point progressively dissolves hemicelluloses which are responsible and desirable for certain papermaking qualities. Increasing the effectiveness of the caustic extraction does reduce the demand for hypochlorite but the advisability of forcing this reaction must be considered in the light of a reduction in pulp yield before such measures are recommended.

The hypochlorite which constitutes the last step of this fundamental three-stage procedure is essentially one of brightening by means of oxidation. In view of the fact that cellulose is readily oxidized, the best results are obtained when this reaction is mild, well controlled and as selective as possible as regards the impurities.

Procedure Development

In order to produce pulps of higher brightness than those possible with the three-stage procedure which has been outlined, experiences advises the use of a second hypochlorite stage to increase the purity of the pulp before the final brightening stage. Re-

* Presented at the Fall Meeting of the Technical Association of the Pulp and Paper Industry, Hotel Syracuse, Syracuse, N. Y., Sept. 12-14, 1939.

[1] Member TAPPI, Hooker Electrochemical Company, Niagara Falls, N. Y.

search has shown that the majority of the impurities present in kraft pulp are more readily oxidized than is the cellulose itself. Hence, the hypochlorite reaction can be forced with greater safety in the case of pulps in a less purified state.

The addition of a second hypochlorite in the sequence just previous to the final hypochlorite has been tried in several bleacheries and an improvement in color has been obtained without noticeable reduction in strength. The addition of a hypochlorite just previous to the caustic extraction has always been tried and in this location the hypochlorite is reported to be even more effective. Inserting a hypochlorite in the sequence in this latter location results in the creation of a four-stage procedure with each stage concluded by a wash. This procedure consists of: a mildly forced chlorination at a low *p*H for a short period; a strong hypochlorite or relatively short duration; a caustic extraction with alkali concentration sufficient to solubilize the chlorinated and oxidized residues and the difficultly oxidizable dyes; and a mild buffered hypochlorite of relatively long reaction period.

It has also been found that a chlorination and a hypochlorite reaction can be combined to advantage into one stage, without a wash between them. This combination permits forcing the chlorination beyond that possible with a separate chlorination because the unconsumed chlorine can be treated with an alkali to form hypochlorite. The combination results in a slight loss in chemical economy, but in the production of a stronger pulp and in the elimination of one stage. An improved procedure would therefore have three stages with each stage concluded by a wash. This procedure would consist of: a highly forced chlorination at a low *p*H for a short period followed immediately by a strong hypochlorite of relatively short duration without a wash between the two reactions; a caustic extraction similar to that of the four-stage procedure; and a mild hypochlorite similar to the last hypochlorite of the four-stage sequence.

To increase the stability of the pulps produced, double washings with soaking stages in between are often found necessary. Soaking stages are highly recommended especially after the caustic extraction and after the last hypochlorite. Previous to the soaking stage following the last hypochlorite, the suspension is often made slightly acid to assist in the final washing. This adjustment is preferably made with sulphurous acid because of its iron reducing and antichlor properties.

Limited laboratory tests lead to the expectation that a third hypochlorite inserted after the first hypochlorite is effective for the production of still brighter pulps. A procedure for high white, high strength kraft might, therefore, have the following sequence: (1) combined chlorination and hypochlorite; wash; (2) hypochlorite; wash; (3) caustic extraction; wash; (4) water soak; wash; (5) hypochlorite; wash; (6) acid adjustment; and final wash.

If economies in chemicals are desired these often can be made by dividing the chlorination into two or more steps. If certain pulp qualities are desired, additional caustic extraction steps may be found advisable.

Effect of Combining Chlorination and Hypochlorite Reactions into a Single Stage

The disadvantage of combining the chlorination and hypochlorite reactions into one stage in the manner previously discussed is a slight increase in chemical cost. The elimination of the wash after the chlorination is largely responsible for the increase in chemical requirement. Acid products and oxidizable materials which could be removed by washing remain in the suspension to be further acted upon by the alkali and the hypochlorite.

Chemical yields and labor costs are substantially the same for both procedures.

The advantages of combining the chlorination and hypochlorite reaction may be briefly summarized as follows: a stronger pulp can be produced because the chlorination can be forced to a degree beyond that possible with a separate chlorination and a concentrated buffered hypochlorite can be made available immediately following the forced chlorination; and equipment and installation costs can be lower.

In view of the fact that the value of bleached kraft pulp for most of its applications lies in its strength, the advantages of combining chlorination and hypochlorite outweigh the disadvantages.

Batch vs Continuous Operation

Batch and continuous operations can be employed for any of the steps described.

Chlorination: For chlorination, batch operations require a determination for each batch of: the quantity of pulp; the chemical requirement of the pulp; and the quantity of chemical.

In the continuous system which has a uniform flow of pulp and chemical, a residual chlorine test at some point previous to the exhaustion of the chlorine serves as the guide for the proportioning of chemical to pulp without having to know any of the requirements of the batch system.

During the addition of chlorine in the batch operation, the acidity is increased slowly through the zone of greatest danger of attack on the cellulose. In the continuous operation the dseired acidity is reached promptly minimizing the danger of undesirable oxidation reactions.

Batch operations require more complicated equipment to force the chlorination and at the same time obtain freedom from chlorine loss and contamination of the air with chlorine .

Caustic Extraction: Caustic extraction may be employed in their batch or continuous equipment with equal effectiveness. The choice is largely dependent upon the local conditions and facilities available.

Hypochlorite: The hypochlorite reaction also may be conducted in either batch-wise or continuously operated equipment. The preference in the final hypochlorite seems to be for the batch operation because it permits alternations in reaction time, temperature, and chemical which may be necessary in case of wide variations in the rate of flow or in the quality of the unbleached pulp.

Considering the procedure as a whole, batch methods are desirable when the changes in grade of product are frequent because the identity of a batch can be maintained throughout the procedure. Where grade and production are uniform over a long period of time, strictly continuous operation is applicable. Even here, however, it may be desirable to put in the hands of the operator some means of correcting irregularities in making the last stage batch.

Future Developments

It is difficult to predict the changes in procedure

which will be recommended in the future. In general, the trend is toward simplification. In cases where stringent specifications must be met, however, it appears that a more complicated procedure may be necessary. Whether dealing with reactions with which we are now familiar or with those which are still in the experimental state, the problems involved in planning a bleaching procedure constitute a real challenge to anyone who is interested in the bleaching of kraft pulp.

An Investigation of the Fundamental Scattering and Absorption Coefficients of Dyed Handsheets *

By William J. Foote[1]

Abstract

The direct proportionality of the concentration of dye solutions to the logarithm of their light transmission was shown to hold accurately for the range within which it was used to determine dye retention. It was also shown that the relationship does not hold for high concentrations.

An equation was developed for calculating the retention of each dye component in a handsheet dyed with two dyes of the same class. For basic dyes, the experimental data obtained indicated that, in most cases, neither component interfered with the adsorption of the other in the range studied. Differences in retention due to this interference were less than four per cent.

The fundamental assumptions made in extending the theory of Kubelka and Munk concerning the diffuse reflection of light from homogeneous media to the more complex systems containing pulp plus one or more dye components were investigated, with the following results:

(a) Pulp and dye do not in general absorb light independently of each other, since the absorption coefficient per gram of retained dye varies with different pulps.

(b) The scattering coefficient of a dyed handsheet is practically independent of the dye for dyeings up to one pound per thousand pounds of stock, but it decreases appreciably for heavier dyeings.

(c) The absorption coefficient of a mixture is generally less than the sum of the respective coefficients of the components and may be taken as equal to the sum only for purposes of approximation.

The assumption that the absorption coefficient of dye in a handsheet is directly proportional to the amount of dye present on the fiber was shown to be in error. The proportionality was approximately a straight line function in the range up to three-pound dyeings but deviated strongly with heavier weight dyeings. The empirical relationship is presented in graphic and tabular form.

The International Commission on Illumination (I. C. I.) system of color specification has recently been proposed as a tentative standard TAPPI method for the specification of the color of pulp *(1)* and paper *(2)*. The I. C. I. specification depends upon a calculation involving the spectral reflectance curve which is a graphic representation of the amount of light reflected from the pulp or paper at each wavelength of the visible spectrum compared to the amount reflected from magnesium oxide. The spectral reflectance is an inherent property of the substance tested. Therefore, a fundamental study of color must first involve the investigation of the factors affecting the spectral reflectance of the material in question, dyed handsheets.

Since paper is a diffuse reflecting medium its spectral reflectance is governed by the fundamental physical relationships involving the diffuse reflectance of light from homogeneous materials. Recently, the feasibility of applying these complex relationships to the complicated paper product has been demonstrated.

The purpose of this paper is to verify the validity of the assumptions made in extending the theoretical equations to the more complex cases of media containing several components. It was first necessary to check the effect on the light absorbing capacity of a colored paper of various quantities of dye actually on the fiber. The determination of the quantity of dye on the fiber involved the use of Beer's law for calculating the amount of dye in the white water, after which the amount on the fiber was obtained by subtracting this amount from the original quantity used in the dye bath.

Therefore, Beer's law was checked experimentally to determine *(a)* whether the absorption coefficient is proportional to the concentration of a dye in solution at all wavelengths in the visible spectrum, and *(b)* whether the law is valid for high concentrations.

A. Measurement of Light Absorption by Dye Solutions and Calculation of Dye Retention

Preparation and Testing of Handsheets and White Waters

The most important requisite of handsheets for color measurement is uniformity of spectral reflectance. Tests on a series of sheets made on the British sheet mold *(3)* were quite uniform from sheet to sheet and throughout single sheets when made in the

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[1] Member TAPPI, Consolidated Water Power & Paper Co., Wisconsin Rapids, Wis.

standard manner. Since transmission measurements were to be made on the white waters, it was desired to have as little dilution of the unretained dye as possible, so that enough light would be absorbed to be measurable. When sheets were made on the British sheet mold using only one or two liters of water in the standpipe, the uniformity was no better than that obtained by making the sheets in a Büchner funnel. The sheet-making apparatus therefore consisted of a Büchner funnel large enough to hold a 70-mesh wire and grid plate of the type used in the British mold. The grid plate was fitted tightly into the funnel by means of a rubber gasket.

Since time and temperature of reaction, consistency, *p*H, etc., have a definite effect on the retention of a dye by a papermaking fiber, a convenient standard procedure was outlined and followed. The pulp (1.5 grams) was stirred in a malted milk mixer at 0.3 per cent consistency for ten minutes after addition of the dye. In the case of bleached sulphite, it was necessary to use three grams (consistency of 0.6 per cent) to obtain a sheet which would be sufficiently thick so that five tabs formed an opaque pad for reflectance measurements. The temperature of the dye bath was 25 deg. C. The *p*H of the mixture was adjusted to 4.5 with alum.

After exactly ten minutes' stirring, the mixture was poured into 500 cc. of distilled water with a *p*H of 4.5 and the sheet formed immediately. The Büchner funnel was attached to a two-liter filter flask which was evacuated to 15 cm. of mercury during sheet formation. The sheet was couched onto a British drying plate, pressed between clean blotters at 15 pounds per square inch, and air-dried. The dried sheets were stored in the dark at 65 per cent relative humidity and 70 deg. F. until tested. A representative sample of the white water was saved for transmission measurements.

Reflection and Transmission Measurements

The reflectance of the sheets and the transmittance of the white waters were measured on the G. E. recording spectrophotometer. This instrument, which is described in detail by Hardy *(4)* and by Michaelson and Liebhafsky *(5)*, consists of a double-prism mono-chromator equipped with an automatic slit adjustment for a 10 mmu wavelength band, a photoelectric photometer of the polarization type, an alternating current amplifier, and a recording mechanism.

When reflectivity measurements are made, the sample sheet is cut into two-inch squares and a pad sufficiently thick to be opaque is used. This measurement is labeled R_∞. It was found that the reproducibility of R_∞ on duplicate sheets and of several measurements on the same sheet was $\pm$ 0.2 per cent.

In the case of transmission measurements, the absorption cells were found to be interchangeable in standard and sample beams without changing the value of the transmission reading. The method used, therefore, was to fill one cell with distilled water and place it in the standard beam; dye solutions and white waters were placed in the sample beam. Thus, the transmission value recorded was that of the unknown sample as compared with distilled water and compensated for reflectance and absorption losses due to the cell. Measurements on duplicate samples were reproducible to within 0.2 per cent.

Theory of Transmission Measurements

Light absorption measurement as a means of evaluating the concentration of dye solutions has been known since the time of Vierordt *(6)*. Bouguer's law expresses the relation of the transmission factor of a homogeneous transparent medium to the thickness of the sample. Beer's law states that the transmission factor of a dye solution of constant thickness varies exponentially with the concentration of the dye. Combining Bouguer's and Beer's equations for samples of thickness, q, and concentration, c,

$$T = t^{cq} \equiv e^{-bcq},$$

where T is the transmittance of the solution, t is the transmittance per unit thickness, and b is the absorption coefficient per unit thickness per unit concentration. In practical applications of the equation, b and q are usually incorporated into a constant, k, and the equation is expressed in the form

$$\log T = -kc .$$

The transmittance of several known concentrations of the dye in solution are measured to evaluate the constant of the equation. Thereafter, any unknown concentration may be determined by measuring the transmittance and using the empirically determined curve of log T versus c. The law is usually applied at the wavelength at which maximum absorption of light by the solution takes place, since this permits the greatest sensitivity at low concentrations. However, since the relation must be known for several wavelengths in order to derive the equation for the calculation of the concentrations of dyes in mixtures, the applicability of Beer's law was tested at several wavelengths throughout the visible spectrum. Table I gives the results for basic Fuchsine at three different wavelengths. These data verify the first assumption made, namely, that the concentration of a dye in solution is proportional to the logarithm of the transmittance of the solution. Data for representative dyes of the basic, acid, and direct classes were tabulated and graphed in a similar manner. The commercial, rather than the pure, dyestuff was used, since this work attempted to simulate actual conditions wherever possible.

TABLE I.—RELATION OF CONCENTRATION OF FUCHSINE TO TRANSMITTANCES AT VARIOUS WAVELENGTHS

Concn. g./l.	500 mmu		542 mmu		600 mmu	
	T	log T	T	log T	T	log T
0.000	100.0	2.000	100.0	2.000	100.0	2.000
0.005	54.4	1.736	33.9	1.530	96.0	1.982
0.010	29.6	1.471	11.3	1.053	92.8	1.968
0.015	16.1	1.207	3.8	0.580	89.5	1.952

The agreement of the experimental results with the theoretical equation was good up to concentrations of about 0.02 gram per liter. The largest amount of dye actually introduced into the dyebath was 0.015 gram. Since the white water had a volume of roughly one liter, all white water concentrations fell well within the limits wherein Beer's law holds accurately. Holmes *(7)* has pointed out that Beer's law is not accurate at high concentrations. Table II shows the results on 16 dyes tested at high concentrations. The average difference between calculated and observed value of per cent transmitted light is 1.8 per cent. The calculated values were based upon extrapolation of the data obtained with concentrations up to 0.02 gram per liter. It must be stressed that an error of one per cent in the measured value of log T at a concentration of 0.01 gram per liter will be magnified to an error of five per cent by the extrapolation to 0.05 gram per liter.

TABLE II.—TRANSMITTANCE OF DYE SOLUTIONS AT HIGH CONCENTRATIONS

Dye	Concn. g./l.	T Obs.	T Calc.	log T Obs.	log T Calc.
Quinoline yellow	0.05	21.7	18.4	1.337	1.265
Orange RO	0.05	8.5	4.4	.813	.640
Brilliant crocein FL	0.05	19.9	18.5	1.299	1.270
Ruby PL	0.05	39.8	39.8	1.600	1.600
Anthraquinone blue B	0.05	37.7	37.2	1.576	1.560
Green NV	0.05	12.7	12.3	1.111	1.090
Soluble blue R	0.05	22.6	30.2	1.354	1.480
Rhodamine B	0.10	3.6	1.2	0.556	0.080
Nigrosine WSJ	0.10	11.6	10.0	1.064	1.000
Basic brown BR	0.10	1.4	2.9	0.146	0.466
Brilliant paper yellow	0.05	4.6	3.3	0.663	0.520
Fast orange WS	0.05	25.1	25.4	1.400	1.405
Brown D3GN	0.05	21.2	20.6	1.326	1.313
Congo red	0.05	12.7	11.4	1.104	1.057
Fast red 8BL	0.05	14.0	12.4	1.146	1.095
Green BX	0.05	37.0	36.9	1.568	1.567
Sky blue 6Bx	0.05	17.6	17.2	1.244	1.235
Brilliant violet B	0.05	38.3	38.0	1.583	1.580
Black E	0.05	43.2	43.2	1.636	1.635

Correction for Turbidity of White Waters

In the case of a non-homogeneous material, such as a white water which contains fibers, the measured transmission values will only be accurate if all the light scattered is again collected and finally falls on the photocell. This is accomplished by means of an integrating sphere. However, the glass cell is separated from the opening of the integrating sphere by a distance of about one-half inch, so that some light is lost. To compensate for this scattered light, a correction factor was applied. It was similar to that used by Harrison *(8)*, although he worked with a Hardy color analyzer (the first model of the G. E. recording spectrophotometer), which is radically different in optical design from the spectrophotometer used in this work. The transmission of the dyed white water is divided by the transmission of the undyed white water at the same wavelength and multiplied by 100. It is well known that most dyes transmit just as much light as does distilled water at some portion of the spectrum. This fact is used in correcting for differences in turbidity from one sample to another. Since this correction is rarely more than 0.2 per cent, the amount of difference from the standard is merely added or subtracted from the transmission at the wave length of maximum absorption. The following sample calculation was made on a known concentration of a dye dissolved in white water and justifies the use of the proposed factor:

DYE: SAFRANINE T EXTRA

Concn. g./l.	T 518	T 680	T corr.	log T	Calc. Concn. g./l.
0.000	98.9	99.2	100.0	2.0000	0.000
0.005	62.2	99.1	62.98	1.7992	0.0052
0.010	39.4	99.4	39.71	1.5989	0.0103

Retention Data

Bleached and unbleached sulphite pulps were dyed with representative papermaking dyes of the acid, basic, and direct classes. The kraft and groundwood pulps were dyed only with basic dyes.

The weights chosen for dyeings were one-fourth, one-half, one, three, and five pounds per thousand pounds of pulp, and retention data were determined for the three heaviest dyeings. Since the weight of the sheet, with the exception of the bleached sulphite sheets, was 1.5 grams, a one-pound dyeing meant that the pulp was treated with 0.0015 gram of dye. A sample calculation of percentage retention of Brilliant paper yellow on unbleached sulphite follows. (The concentration in grams per liter of the white water was multiplied by 0.98 to obtain the weight of dye in the white water, since 980 cc. of white water were collected. The weight of dye on the sheet was then found by difference.)

Weight pounds	T corr.	log T	Concn. mg./l.	Weight in sheet mg.	Retention per cent
1	98.25	1.9923	0.2970	1.2089	80.6
3	92.46	1.9660	1.1475	3.3754	75.0
5	86.48	1.9369	2.1296	5.4130	72.2

Retention values for basic dyes on unbleached sulphite pulp are given in Table III.

TABLE III.—PERCENTAGE RETENTION: BASIC DYES ON UNBLEACHED SULPHITE

Dye	1 lb.	3 lb.	5 lb.
Nigrosine WSJ	69.3	60.1	47.7
Auramine	64.7	59.8	51.7
Rhodamine B	79.1	78.3	76.9
Victoria green SC	86.6	82.7	78.5
Methylene blue ZX	79.7	76.3	74.7
Fuchsine conc. powder	87.9	85.8	84.3
Basic brown BR	85.2	84.5	81.2
Safranine T extra	79.9	79.6	79.6
Methyl violet NE	93.9	92.9	92.1
Paper blue R	93.7	93.4	92.5
Chrysoidine GN	42.7	38.9	37.6

Transmission Data on Sheets Dyed with Two Dyes

Since it has been demonstrated that a unit concentration of dye in solution will decrease the transmission a definite amount at each wavelength, it is possible to find the quantity of each of two dyes in a mixture by solving two simultaneous equations based on Beer's law. A method of computing the percentage composition of binary mixtures of oils from transmission measurements has been derived by Barnard and McMichael *(9)*, who developed the following equation:

$$T_m = T_1^{P1}\, T_2^{P2} .$$

This is not strictly applicable to solutions of dyes, because the transmission measurements were made at one wavelength only and a given combination of two dyes may have many different proportions producing a certain transmittance at a given wavelength. Therefore, a set of two simultaneous equations involving transmission measurements at two wavelengths was developed for calculating the retention of individual dye components in a white water containing two dyes. The derivation follows:

A solution of dye, F, has maximum light absorption at wavelength, M. A solution of dye, G, has maximum light absorption at wavelength, N.

f milligrams of F reduces log T by h' units at M, and by i' units at N.

g milligrams of G reduces log T by j' units at N, and by l' units at M.

$$h' = fh ,$$
$$i' = fi ,$$
$$j' = gj ,$$
$$l' = gl ,$$

where h and i are constants indicating the decrease in log T per milligram of dye F in solution at the wavelengths M and N, and j and l are constants indicating the decrease in log T per milligram of dye G at the same wavelengths. Distilled water has a transmission of 100 per cent and, consequently, its log T = 2.0000. The decrease in log T at any wavelength will be evaluated by the term, 2.0000 — log T. Therefore,

$$[2.0000 - \log T_{(M)}] = h' + l' = fh + gl , \text{ and}$$
$$[2.0000 - \log T_{(N)}] = i' + j' = fi + gj .$$

Solving simultaneously,

$$f = [j\,(2.0000 - \log T_{(M)}) - l\,(2.0000 - \log T_{(N)})]/(jh - li) , \text{ and}$$
$$g = [(2.0000 - \log T_{(N)}) - fi]/j .$$

Since the wavelengths chosen are those of maximum absorption, h and j may be found directly from the data obtained in checking Beer's law by dividing the decrease in log T by the concentration in milligrams which produced it; i and l are found by inspecting the transmission curves for the same standard solutions at the appropriate wavelengths and again dividing the decrease in log T by the concentration (in milligrams). Table IV gives values from which the four constants may be determined, depending upon the wavelengths and dyes used.

A sample calculation using the derived equations is given for mixtures of known concentrations of Safranine T extra and Fuchsine concentrated powder.

TABLE IV.—CONSTANTS FOR RETENTION CALCULATION IN MIXED DYEINGS

Dye	430 mmu	518 mmu	542 mmu	586 mmu	618 mmu	664 mmu
Victoria green SC..	0.0170		0.0155		0.0852	0.0094
Safranine T		0.0400	0.0234		0.0002	
Fuchsine		0.0674	0.0940		0.0011	
Auramine	0.0614			0.0000	0.0000	0.0000
Methyl violet				0.0676		0.0017
Methylene blue	0.0008	0.0044		0.0308	0.0553	0.0848

This mixture was chosen because the wavelengths of maximum absorption are very close together and the effect of each dye will be large at the wavelengths at which transmissions are measured, and consequently the deviation between calculated and observed concentration will be a maximum.

Concn. Saf.	Concn. Fuch.	T_{518}	T_{542}	log T_{518}	log T_{542}	Calculated Concn. Saf.	Calculated Concn. Fuch.
0.005	0.005	29.1	26.0	1.4639	1.4150	0.00506	0.00496
0.010	0.010	8.4	6.6	0.9243	0.8195	0.00996	0.01008

There are two major possibilities of error in using the formula. If any of the constants appearing in the form *(jh-li)* in the denominator of the equation for *f* vary by 0.001, the resultant change in the calculated concentration may vary by as much as 4 per cent (if the product is in the range of 2.000). If the value of the product is in the vicinity of 8.000, the error in the calculated concentration would amount to only 1 per cent. The smallest and largest values for the denominator encountered during the work on dyeings containing two components were 2.000 and 8.000.

The weight of dyeing also has an effect on the percentage error. If the error in calculated concentration mentioned before occurs in the case of a one-pound dyeing, the error in per cent retention may be as large as 2 per cent. For this same error in the case of a five-pound dyeing, the error in per cent retention would amount to 0.4 per cent.

The second source of error is in the measurement of transmission values. If the transmission measurement is in error by 0.2 per cent (the limit of experimental accuracy) in the first illustration given above, the calculated concentrations of safranine and fuchsine will be 0.00525 and 0.00487, respectively. The effect of this variation on percentage retention again depends upon the weight of dyeing and the actual weight of dye in the white water.

Retention Data on Sheets Dyed with Two Dyes

Retention data were determined on sheets of unbleached sulphite dyed with combinations of two basic dyes (with this class there is no chemical interaction between the dyes). The dyes were so chosen that all possible combinations of the four colors, red, yellow, green, and blue, could be made. The percentage retention of the combination dyeings are presented in Table V.

The mixture data are internally consistent with the exception of those cases marked with an asterisk. If the retention of a dye component did not decrease as the weight of the dyeing increased in approximately the same proportion as it did in the case of single dyeings, the per cent retention was marked with an asterisk. The retention data for the mixtures do not always agree with the retention data on single dyeings. In most cases, the retention of the components is slightly less than the retention of the same dyes when dyed individually on the fiber. The difference amounts to less than 4 per cent in practically all cases.

TABLE V.—RETENTION DATA ON MIXTURES OF DYES

Fuch. — fuchsine concentrated powder
Vic. — victoria green SC
MeZX — methylene blue ZX
Saf. — safranine T extra
Aur. — auramine
MeVi — methyl violet NE

Weight of Dyeing lb./1000 lb		Retention per cent	
Fuch.	Vic.	Fuch.	Vic.
0.25	0.25	86.6	93.3
0.5	0.5	82.8	88.7
1.0	1.0	75.3*	86.9
3.0	3.0	78.9	80.4
5.0	5.0	78.0	75.7
0.5	1.5	80.8	84.0
1.5	1.0	82.5*	88.0
0.5	3.0	81.6	80.8
0.5	5.0	82.1	77.4
1.5	0.5	81.5	88.5
Saf.	MeZX	Saf.	MeZX
0.5	0.5	74.0*	74.4
1.5	1.5	79.6	72.8
3.0	3.0	77.3	73.7*
5.0	5.0	78.7*	73.8*
MeVi	MeZX	MeVi	MeZX
1.0	1.0	93.0	72.6
3.0	3.0	91.4	67.2
5.0	5.0	90.1	63.8
1.0	3.0	92.2	80.6*
0.25	0 25	85.5	84.5
0.5	0.5	84.3	81.7
1.0	1.0	74.0*	82.8*
3.0	3.0	80.1	83.4*
0.5	1.5	81.8	78.1
1.5	0.5	78.4	81.5
0.5	1.0	81.2	79.3
0.5	3.0	81.5	77.3
0.5	5.0	79.5*	77.0
Aur.	MeZX	Aur.	MeZX
0.5	0.5	58.9	80.1
1.5	1.5	53.5	71.0
3.0	3.0	47.0	67.4
5.0	5.0	43.2	68.5*
Aur.	Vic.	Aur.	Vic.
0.5	0.5	57.4	91.1
1.5	1.5	52.0	85.6
3.0	3.0	47.7	82.8

However, the cases where one dye was held constant at one-half pound while the weight of the other was increased to five pounds should be inspected. The retention of the half-pound dyeings remained constant irrespective of the weight of dyeing of the second component. These results justify the conclusion that, within the range studied, there is no appreciable physical interference between basic dye components, as far as their retention on the fiber is concerned.

B. Quantitative Work on Fundamental Optical Constants

The color problem of the papermaker is to produce a sheet having a spectral reflectance curve such that the color of the sheet matches that of the sample specified. To accomplish this, it is necessary to study the factors which influence the spectral reflectance curve of the finished sheet, so that proper changes may be made in color furnish or other variables in order to produce the desired changes in the spectral reflectance of the sheet.

It is the purpose of this section to review the relation of the scattering and absorption coefficients of a sheet of paper to its spectral reflectance, and to demonstrate the effects of certain variables upon these fundamental optical constants. It was also desired to check the validity of certain assumptions made with respect to the behavior of these constants in complex dye-fiber systems.

Theory of Diffuse Reflection of Homogeneous Media

When light is incident upon an opaque material such as paper, part of it is reflected, part is trans-

mitted, and part is absorbed and scattered. Theoretical expressions for the diffuse reflection of homogeneous materials in terms of fundamental constants have been derived by Ryde *(10)*, Guerevic *(11)*, and Kubelka and Munk *(12)*. An empirical relation is described by Appel *(13)*. The equations of Guerevic are the simplest to manipulate but those of Kubelka and Munk are more obviously related to physical phenomena. Their basic equation may be expressed as

$$R_\infty = 1 + (K/S) - [(K/S)^2 + 2(K/S)]^{0.5},$$

where K and S are the absorption and scattering coefficients of the material and $R\infty$ is the reflectance of an opaque pad. Steele *(14)* and Judd *(15)* have extended the theory to make it applicable to the paper industry.

The equation of Kubelka and Munk has been successfully applied to describe the optical behavior of paper for practical purposes by Judd *(16, 17)*, Lewis *(18)*, and Steele *(14)*. Steele *(19)* has also demonstrated the value of the theory in evaluating the effects of filler in paper. In connection with the dyeing of paper, Harrison *(8)* showed the applicability of the theory for measuring the retention of dyes. Nolan *(20)* predicted the color of sheets of paper dyed with combinations of dyestuffs from an analysis of the components in terms of the equations of Kubelka and Munk in a form extended to meet this more complex case.

The basic assumptions of the theory of Kubelka and Munk, which may be assumed to hold true for the case of paper measured on the G. E. recording spectrophotometer, are:

(a) The medium is homogeneous and sufficiently thick to be opaque, and

(b) reflectance is determined for completely diffuse illumination.

The extension of the theory to complex media depends upon the following assumptions, which must be tested experimentally:

(a) The pulp and dye absorb and scatter light independently of each other;

(b) the absorption and scattering coefficients of a mixture are the sums of the respective coefficients of the components;

(c) the absorption coefficient of a dye in a dye-pulp mixture is directly proportional to the amount of dye adsorbed by the pulp;

(d) the scattering coefficient of the dye is so small in comparison with that of the pulp that it may be considered to be negligible; and

(e) the retention of each dye in a system of several dyes with a single pulp is the same as the retention of the dye when dyed separately on the given pulp, provided that there is no interaction between the dyes.

Optical Constants of the Pulps Used

Standard British sheets were made using the pulps alone and in combination. Table VI is a resumé of the results of the optical measurements on these sheets. S and K were calculated in units per gram of pulp in the handsheet.

It is interesting to note that the absorption coefficient of the 50-50 mixture of bleached and unbleached sulphite is the average of the absorption coefficients of the two individual pulps. The relationship,

TABLE VI.—OPTICAL CONSTANTS OF PULPS USED

A Bleached sulphite
B 50-50 mixture of bleached and unbleached sulphite
C Unbleached sulphite
D Kraft
E Groundwood-sulphite (50-50 mixture)

	Scattering Coefficient, S			Absorption Coefficient, $K\times10^6$		
	430	560	670	430	560	670
Pulp	mmu	mmu	mmu	mmu	mmu	mmu
A	0.0832	0.0397	0.0364	4044	760	292
B	0.0801	0.0685	0.0602	14730	4380	1772
C	0.0766	0.0703	0.0620	24400	7690	3124
D	0.0697	0.0773	0.0782	88500	32320	12620
E	0.1546	0.1394	0.1310	45900	14630	7370

$$K_{12} = 0.5\ K_1 + 0.5\ K_2$$

apparently holds true for this case (K_1 and K_2 are values for the individual pulps and K_{12} is that for the mixture). The scattering coefficient does not follow a similar relationship. Nevertheless, inspection of the data shows that, roughly,

$$(K/S)_{12} = 0.5\ (K/S)_1 + 0.5\ (K/S)_2.$$

Thus, it would be permissible to use this latter relationship in the case of mixtures of bleached and unbleached sulphite pulps with reasonably good approximation.

Derivation of Equation for Calculating SX

The following terms will be used in the discussion:

$R_{R'}$ = reflectance of material when backed by a medium of reflectance, R'.
$R_{.98}$ = reflectance when sheet is backed with magnesium oxide.
R_∞ = reflectance when sheet is backed by a perfect black.
X = weight of sheet.
e = base of natural logarithms.

$K_{12} = K_1 + K_2$ may be read as "the absorption coefficient of a mixture is equivalent to the sum of the absorption coefficients of the two components." Conventionally, subscript 1 will always refer to the pulp; subscripts 2 and 3 to the first and second dyes.

Taking Steele's intermediate step in his derivation of equation III *(14)*,

$$\frac{(R_{R'} - 1/R_\infty)\ (R' - R_\infty)}{(R' - 1/R\infty)\ (R_{R'} - R\infty)} = e^{SX\ [(1/R\infty) - R\infty]}$$

and solving for SX in the cases where $R' = .98$, we obtain

$$SX = \frac{2.303}{(1/R\infty - R\infty)} \log \frac{(R_{.98} - 1/R_\infty)\ (.98 - R_\infty)}{(.98 - 1/R_\infty)\ (R_{.98} - R_\infty)}.$$

This equation and measurements of $R_{.98}$ and $R\infty$ were used to calculate SX. Because the basis weight can be measured more accurately than caliper, X is taken as the basis weight in pounds per ream ($24 \times 36 - 500$), or simply as the weight in grams of a single sheet. Therefore, S, as evaluated, is in terms of scattering coefficient per pound per ream, or as S per gram. (K/S) is calculated from the measurement of $R\infty$. S is found by dividing SX by X, and K is found by multiplying (K/S) by S.

Effect of Variation of Basis Weight on Fundamental Optical Constants

To evaluate the optical constants of a bleached sulphite pulp and to indicate the precision of experimental accuracy, S and K were measured on carefully formed sheets varying over a wide range of basis weights. Results for duplicate sheets are given in Table VII and for varying basis weights in Table VIII.

If the SX values were directly proportional to X, all values of S at a given wavelength in the above table would have been identical. If $R\infty$ values were reproducible, the values of K and (K/S) would also

TABLE VII.—UNIFORMITY OF OPTICAL CONSTANTS OF DUPLICATE SHEETS

(500 mmu 50 lbs./sq. in.)				(670 mmu 25 lbs./sq. in.)			
X	*R*∞	*S*	*K*	*X*	*R*∞	*S*	*K*
66.8	78.7	.0448	1291	54.4	88.8	.0384	271
69.6	78.5	.0448	1319	54.2	88.9	.0403	279
70.5	78.7	.0430	1239	54.5	88.9	.0393	273
67.2	78.7	.0420	1210	53.3	88.9	.0402	279
68.4	78.5	.0434	1277	53.5	88.7	.0403	290
68.5	78.6	.0436	1270	54.0	88.8	.0397	280

TABLE VIII.—EFFECT OF VARIATION IN BASIS WEIGHT ON *S* AND *K* OF BLEACHED SULPHITE

Basis Weight pounds	Scattering Coefficient, *S*			Absorption Coefficient, *K* × 10³		
	500 mmu	600 mmu	670 mmu	500 mmu	600 mmu	670 mmu
27.2	0.0412	0.0389	0.0386	1018	464	339
41.1	0.0408	0.0380	0.0380	1055	447	295
54.9	0.0404	0.0376	0.0364	1103	462	287
68.5	0.0420	0.0400	0.0387	1098	484	328
138.0	0.0429	0.0398	0.0390	1210	511	330

have been identical, since *K* is obtained by multiplying *(K/S)* by *S*. The values of *K* and *S* are found to vary for duplicate sheets. Table VII is presented to indicate the magnitude of these variations and to determine whether the changes produced in *K* and *S* by the sheetmaking variables are real, or merely due to experimental error. The two cases chosen illustrate the magnitude of the variation in duplicate sheets when the values of *K* and *S* are near their extreme values for the given pulp. The percentage variation in *K* at an average value of 1270 is 4.8 per cent and at 280 is 3.6 per cent. For *S*, the deviation from the average value of 0.0436 is 3.7 per cent and from 0.0397 is 3.3 per cent. In passing from a basis weight of 27 to 138 pounds *R*∞ decreased by 1% at 500 mmu, by 0.5% at 600 mmu and was practically constant at 670 mmu. This variation may be due to non-uniformity of the pulp, or the *R*∞ readings may be affected by the actual number of sheet to sheet interfaces penetrated by the light. Whatever the explanation, the variation in thickness effects a variation in calculated *(K/S)* values, and, hence, a variation in the values of *K*. If the *R*∞ value had been constant at 80.1 for all measurements made at 500 mmu in Table VIII, the *K* values would have been (reading from top to bottom) 1018, 1009, 1000, 1078, and 1060, respectively.

Effect of Variation in Formation Pressure upon the Optical Constants

To demonstrate a case where one of the coefficients *(S)* changes while the other *(K)* remains constant, a series of British sheets was made using a wide range of pressures. It is obvious that at higher pressures the fibers are forced closer together and, consequently, more fiber-fiber contacts are effective. The greater number of such contacts, the more transparent the sheet will be since there will be less chance for light scattering. Results for the series are given in Table IX.

Using the values for duplicate sheets (Table VII) as a criterion, it is seen from Table IX that *K* does not vary with the pressure used in forming the sheet, whereas *S* exhibits a real decrease as the pressure increases. Another fact which may be noted from Tables VIII and IX is that the scattering coefficient

TABLE IX.—EFFECT OF VARIATION IN FORMATION PRESSURE ON OPTICAL CONSTANTS OF BLEACHED SULPHITE

Pressure lbs./sq. in.	Scattering Coefficient, *S*			Absorption Coefficient, *K* × 10³		
	500 mmu	600 mmu	670 mmu	500 mmu	600 mmu	670 mmu
10	0.0467	0.0429	0.0417	1163	431	267
25	0.0440	0.0406	0.0397	1039	434	280
50	0.0404	0.0376	0.0364	1103	462	287
100	0.0369	0.0341	0.0339	1030	426	273

decreases with increasing wavelength. This is consistent with the theory of scattering, which states that the percentage of light scattered increases with decreasing wavelengths.

Effect of Variation in Freeness on the Optical Constants

A beater run, using bleached sulphite pulp, was made to illustrate the effect of stock freeness on the absorption and scattering coefficients. At the same time that samples were withdrawn for making undyed sheets, enough additional stock was removed to make sheets which were dyed with one pound of Safranine T. extra.

Data from measurements made on these sheets would then be available for determining whether *(a)* dye and pulp absorb and scatter light independently of each other, and *(b)* the scattering coefficient of the dye is small when compared with that of the pulp.

Reflectance measurements were made at 518 mmu, the wavelength of maximum light absorption by sheets dyed with Safranine. The weight of the sheets was increased as the stock became more transparent. *S* is calculated in terms of units per gram of pulp. The results are given in Table X.

TABLE X.—EFFECT OF VARIATION IN FREENESS ON OPTICAL CONSTANTS OF BLEACHED SULPHITE (measurement at 518 mmu)

Freeness cc. S.R.	Weight g.	*R*∞	*R*∞ (undyed sheets)	*SX*	*S* per g.	*(K/S)*	*K* per g.
810	1.145	82.1	92.7	1.528	1.333	.0195	.026
640	1.130	78.0	90.7	1.337	1.182	.0310	.038
490	1.713	72.5	82.5	1.933	1.128	.0521	.059
360	1.911	66.0	75.5	1.831	0.959	.0886	.085
	(sheets dyed with 1 pound of Safranine)						
810	1.176	56.2	63.3	1.754	1.490	.1707	.254
640	1.020	50.8	62.4	1.170	1.148	.2387	.274
490	1.698	48.6	52.2	1.892	1.114	.2726	.304
360	1.949	45.2	48.2	1.823	0.936	.3322	.310

The data for undyed sheets in Table X show that *S* decreases as the freeness decreases. It may be said that the effects of increased pressure and decreased freeness are analogous. Each results in a more compact formation of the sheet as a result of more intimate association of the fibers therein.

The Magnitude of S_2 and the Constancy of K_2

The difference between *S* values for lightly dyed and undyed sheets is very small; if anything, the scattering coefficient of the sheet is decreased by the addition of the dye. This same trend is to be noted in Tables XII and XIII. In this case, the assumption that the scattering coefficient of the dye itself is negligible in comparison with that of the pulp is quite justified. Applying the expression

$$K_{12} = K_1 \text{ (pulp)} + K_2 \text{ (dye)}$$

to the data, it is found that K_2 has values of 0.228, 0.236, 0.245, and 0.225. In view of the limits of experimental accuracy already pointed out, this fact may be taken as a point in favor of the validity of the assumption that dye and pulp absorb light independently of each other, since the absorption coefficient due to one pound of Safranine was constant irrespective of the absorption coefficient of the fiber. However, it must be pointed out that the absorption coefficient of a unit weight of dye changed depending upon which pulp was used as a base stock. That is, one gram of dye on kraft pulp absorbed more light than one gram of the same dye on unbleached sulphite. Consistently, the absorption coefficient per gram for the same dye on unbleached sulphite was greater than on bleached sulphite.

TABLE XI.—REFLECTIVITY, (K/S), WEIGHT OF DYE ON PULP IN THE WHITE WATER FOR BASIC DYES ON KRAFT PULP

Dyestuff (Wavelength Measured)	Wt. of Dyeing lbs.	$R\infty$	(K/S)	Wt. Dye in Sheet mg.	Wt. Dye in White Water mg.	Per-centage Retention
Basic brown BR....	0	31.6	.7403	...	...	...
(480 mmu)	½	25.4	1.0955	0.49	0.26	...
	1	20.8	1.5079	0.96	0.54	63.7
	5	11.1	3.5600	4.65	2.85	62.0
	10	8.2	5.1386	9.01	5.99	60.1
Fuchsine	0	43.7	.3627	...	...	...
(560 mmu)	½	20.6	1.5302	0.50	0.25	...
	1	15.7	2.2632	0.95	0.55	63.3
	5	8.3	5.0556	3.99	3.51	53.2
	10	6.6	6.6088	7.55	7.45	50.3
Victoria green SC...	0	56.1	.1718	...	...	...
(640 mmu)	½	18.3	1.8237	0.59	0.16	...
	1	12.9	2.9405	1.07	0.43	71.5
	5	6.6	6.6088	3.55	3.95	48.8
	10	5.3	8.4605	5.68	9.32	37.8
Methylene Blue ZX	0	62.0	.1165	...	...	...
(680 mmu)	½	19.5	1.6616	...	...	...
	1	14.1	2.6166	0.93	0.57	61.9
	5	7.4	5.7938	3.61	3.89	48.1
	10	6.2	7.0955	6.32	8.68	41.1
Paper blue R.....	0	49.9	.2515	...	...	...
(600 mmu)	½	17.1	2.0095	...	...	...
	1	12.1	3.1927	1.36	0.14	90.8
	5	5.9	7.5126	5.84	1.66	78.5
	10	5.0	9.0250	10.45	4.55	69.7
Methyl violet NE..	0	49.9	.2515	...	...	...
(600 mmu)	½	18.8	1.7536	...	...	...
	1	13.5	2.7712	1.26	0.24	84.2
	5	6.2	7.0955	5.87	1.63	78.3
	10	5.0	9.0250	10.31	4.69	69.0
Safranine T extra...	0	40.6	.4345	...	...	...
(540 mmu)	¼	25.4	1.0955	0.38	0.37	...
	1	20.3	1.5646	0.71	0.79	47.6
	5	11.2	3.5203	2.97	4.53	39.7
	10	8.7	4.7906	5.16	9.84	34.4
Chrysoidine GN ...	0	28.7	.8857	...	...	...
(460 mmu)	½	24.9	1.1325	...	...	...
	1	22.7	1.3161	0.75	0.75	50.0
	5	15.6	2.2831	3.36	4.14	44.9
	10	11.4	3.4430	6.52	8.48	43.5

Variation of (K/S) values with Concentration of Dye

Data obtained from reflectance measurements of the dyed handsheets and transmission measurements of the white waters are given in Table XI in a form convenient for demonstrating the variation of the (K/S) ratio with the concentration of dye actually retained by the pulp. It has been found by Harrison *(8)* that the absorption coefficient at any wavelength is nearly proportional to the weight of dye absorbed. Lewis *(18)* reports cases of black dyeings where there were measurable deviations from a linear relationship. Harrison found the proportionality to hold less rigidly at high weights (three-pound dyeings were the heaviest investigated by him).

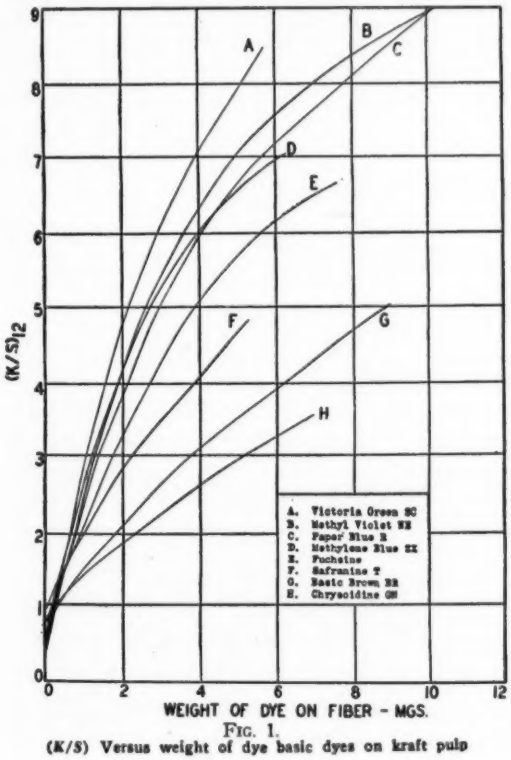

FIG. 1.
(K/S) Versus weight of dye basic dyes on kraft pulp

If the data from Table XI are plotted (Fig. 1), using actual weight of dye absorbed and (K/S) as the abscissa and ordinate, it is seen that the relationship is not a linear one. All types of dyes investigated on the four commercial pulps gave similarly shaped curves. From the curves, it would seem that the deviation was not large in the range up to one-pound dyeings (weight actually on the fiber of a single sheet for a one-pound dyeing having a retention of 70 per cent would be 0.70 × 0.0015 or 1.05 milligrams). Since (K/S) does not display a linear relationship with the weight of dye on the fiber, this concept can only be used as an approximation (and never in the range above three-pound dyeings) in predicting the value of $R\infty$ for a certain weight of dye. The curves of Figure 1 may be so utilized.

It was found, however, that when log (K/S) was plotted against log a, a being the weight of dye on the fiber, the result was a straight line. The empirical relation may be plotted on either Cartesian or log-log co-ordinates, depending upon which one is the more convenient for the purpose for which it is to be used. The slopes of these lines on a log-log scale vary from 0.6 to 0.95 which indicates that (K/S) is more nearly proportional to the 0.6 to 0.9 power of the concentration than to the first power. It is also found that for a given dye the power of the concentration varies with wavelength.

With respect to the mixture data, it has been assumed that the following relation would hold:

$$(K/S)_{123} = (K/S)_{12} + (K/S)_{13} - (K/S)_1$$

Using the curves of Figure 1, calculated values of $(K/S)_{123}$ for mixtures of Safranine and Fuchsine ($R\infty$ measured at 540 mmu) were found to be higher than the observed values. The deviation was 4 per cent in the case of dyeings using ¼ pound of each component, and 27 per cent when the dyeings consisted of three pounds of each. Therefore, the relation is of the nature,

$$(K/S)_{123} = (K/S)_{13} + f(K/S)_{12} - (K/S)_1$$

where $f(K/S)_{12}$ is the effective $(K/S)_{13}$ in the presence of the first dye and depends upon the weight of the first dye present. Figure 2 gives the results of an investigation of the nature of $f(K/S)_{12}$ for mixtures of Safranine and Fuchsine. The solid lines indicate the value of (K/S) for different weights of dyeings of the two components individually (R_∞ being measured at 540 mmu). The broken lines show the effect of adding one-half pound of Fuchsine successively to one, three, and five pounds of Safranine.

It is apparent that the $(K/S)_{13}$ is smaller at heavier dyeings of Safranine. If the addition of one-half pound of Fuchsine to a weight of Fuchsine producing a value of $(K/S)_{12}$ equivalent to that produced by one pound of Safranine is considered, it will be seen that the change in $(K/S)_{13}$ is less than the change for the same quantity of dye added to the Safranine base.

Figure 3 shows $\Delta(K/S)_{13}$ produced by one-half pound of Fuchsine with different weights of Safranine at four different wavelengths. The broken line represents $\Delta(K/S)_{13}$ due to the addition of one-half

pound of Fuchsine to amounts of Fuchsine which produce values of $(K/S)_{12}$ which are equal respectively to those produced by one, three, and five pounds of Safranine. The slope of the $\Delta(K/S)_{12}$ versus a for the Fuchsine-Safranine combinations is approximately twice the slope for the Fuchsine-Fuchsine combination. In other words, the effectiveness of the one-half pound of Fuchsine is greater on a Safranine base, but the relative decrease in efficiency of the one-half pound of Fuchsine is less with increasing amounts of Fuchsine than with increasing amounts of Safranine. This type of analysis may be applied to all the mixture data. Since the $\Delta(K/S)_{12}$ versus a lines were not parallel, the application of the assumptions made is not accurate for all wavelengths of the visible spectrum.

From consideration of the reflectance curves of sheets containing different mixtures of two dyes, it was found that the calculated $(K/S)_{12}$ values were greater than the observed values. This appears to be a very general relation and the discrepancies between the calculated and the observed values of $(K/S)_{12}$ are in the same direction as the deviation from a linear relation between (K/S) and concentration for a single dye. This fact gives rise to the practical result that calculated reflectance curves for sheets containing mixtures of dyes will be lower than the observed curves by 0.5 to 3 per cent reflectance. Hence, it is to be emphasized that the expression for the (K/S) of a mixture in terms of the (K/S) values of the components should be used only for purposes of approximation.

Quantitative Examination of K and S In Dyed Sheets

To make a quantitative study of both the K and S values for sheets containing dye, handsheets were made using two dyes which yielded results deviating

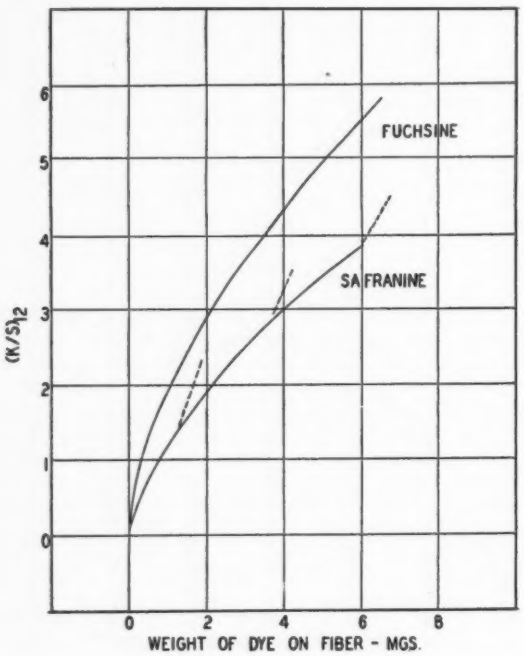

Fig. 2.
(K/S) Versus weight of dye fuchsine and safranine

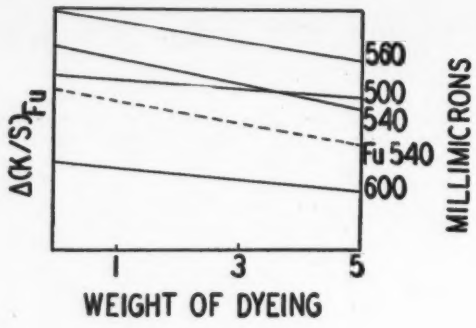

Fig. 3.

badly from a linear relationship between (K/S) and concentration of dye, a; namely, Fast orange WS on bleached sulphite, and Victoria green SC on unbleached sulphite. The values obtained are presented in Tables XII and XIII. As pointed out previously, the scattering coefficient is remarkably constant when the absorption coefficient is small. Measurements made at wavelengths nearest to the wavelength of maximum absorption for the dye concerned, 500 mmu in the case of orange WS and 630 mmu in the case of Victoria green, show that the scattering coefficient tends to be smaller for the more heavily dyed sheets than for the undyed sheet. The reason for the decrease in scattering coefficient with increase in weight of dye adsorbed has not been found.

The values of K in Table XII and Table XIII indicate that a direct proportionality between the absorption coefficient and the amount of dye adsorbed by the fiber does not exist.

TABLE XII.—OPTICAL CONSTANTS OF UNBLEACHED SULPHITE DYED WITH VICTORIA GREEN SC

Wt. lbs.	X lbs.	R_∞	$R_{.m}$	SX	S	(K/S)	K
0	18.4	71.1	90.5	.704	.0381	.0586	.0022
½	18.6	32.9	44.8	.761	.0389	.6907	.0240
1	18.0	22.8	30.5	.596	.0331	1.3099	.0433
3	18.7	13.7	15.8	.534	.0300	2.7227	.0764
5	17.2	10.1	11.6	.428	.0249	4.0088	.0994

TABLE XIII.—OPTICAL CONSTANTS ON BLEACHED SULPHITE DYED WITH FAST ORANGE WS

Wt. lbs.	X lbs.	R_∞	$R_{.m}$	SX	S	(K/S)	K
0	16.3	79.2	92.5	.667	.0409	.0370	.0016
½	17.5	50.1	69.9	.767	.0438	.2492	.0109
1	17.4	41.6	59.0	.714	.0412	.4111	.0170
3	19.1	26.1	35.3	.630	.0330	1.0497	.0346
5	18.0	20.0	25.8	.573	.0321	1.6065	.0510

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Review Of Paper Industry Literature

Copies of United States Patents can be obtained from the United States Patent Office, Washington, D. C. for 10 cents each. Send currency, not stamps.

Coating

Coating. Angus MacLachlan. U. S. pat. 2,136,557 (Nov. 15, 1938).—A fibrous container for oily and greasy material is rendered moisture and grease proof by impregnating or coating with a hydrogenated fish oil (e.g., menhaden oil) in which the hydrogenation has been carried to a point such that the product is a hard material which melts fairly sharply at about 55 deg. C. (130 Deg. F.), and which does not become soft or sticky or greasy much below that temperature. The material as it comes from the hydrogenation process usually has a rather strong, sweetish odor which, if objectionable, may be removed by melting the material in vats at a high temperature and blowing with steam under a vacuum as high as practicable, or by other suitable treatment.—A.P.-C.

Coating Compositions for Coated Paper. Kurt Schwabe and Ralf Niethammer, trading as Külber & Niethammer. Brit. pat. 496,775 (Dec. 6, 1938).—The compositions are prepared by adding to a filler a binding agent comprising a neutral solution containing a relatively small amount of one or more water-soluble cellulose ethers. Further binding agents (such as casein or starch) may also be incorporated. Among examples, a solution in water of 50 parts of methylcellulose is stirred with 2000 parts of China clay—A.P.-C.

Varnished Paper. Arthur Reilly, assignor to S. D. Warren Co. U. S. pat. 2,139,603 (Dec. 6, 1938).—A coated paper suitable for taking printing is prepared by applying to a surface of a sheeted paper a coating of a composition consisting essentially of a fatty acid derived from a drying oil, the solution containing resin dispersed therein in an amount from 1.5 to 7.5 times the fatty acids content, and drying the so-coated paper.—A.P.-C.

Sheet Wrapping Material of Coated Glassine. Erich Gebauer-Fuelnegg and Eugene W. Moffett, assignors to Marbo Patents, Inc. U. S. pat. 2,140,835 (Dec. 20, 1938).—Glassine sheets are provided with a thin grease- and moisture-resistant coating which may be formed of a mixture containing 30 to 75 per cent of rubber hydrochloride and 70 to 25 per cent of a chlorinated paraffin.—A.P.-C.

Apparatus for Proofing or Coating Hollow Articles Such as Paper Bottles, Cups or Containers. Herbert M. Ware. Brit. pat. 493,896 (Oct. 17, 1938).—An apparatus wherein the articles are carried into, through and out of the proofing liquid by a guided, endless-chain carrier, the carrier has pivotally mounted thereon a series of article-supporting elements that are caused to move about their pivots to assume different angular positions in relation to the carrier as the articles pass through the various stages of treatment.—A.P.-C.

Coating Apparatus for Strip Material. Russell K. Nash, assignor to B. B. Chemical Company. U. S. pat. 2,149,307 (March 7, 1939).—This is an improvement on U. S. pat. 1,898,383, of Feb. 21, 1933.—It provides a novel arrangement for holding the strip tightly against the opening of the nozzle whenever the strip is stationary, and for quickly releasing the strip when the material is to be coated. This controlling means is automatically operated through the tension applied to the strip.—A.P.-C.

Coated Cellulose Fabric. Robert W. Ball, assignor to Canadian Industries, Ltd. Can. pat. 378-406 (Dec. 20, 1938).—To a cellulose fabric, such as wrapping paper, is applied a molten, non-aqueous dispersion containing mineral wax, a white inorganic pigment of high hiding power having a refractive index of at least 1.89 and, as a dispersing agent, a weak organic acidic compound.—A.P.-C.

Rubber Coatings on Materials Such as Artificial Leather. Milton O. Schur, assignor to Brown Company. U. S. pat. 2,135,151 (Nov. 1, 1938).—A method of smoothly coating a base comprises applying thereto as successive smooth coats a very fluent aqueous composition containing water-dispersed rubber and sufficient water-immiscible but volatile rubber solvent to swell the dispersed rubber particles appreciably but short of inducing their coagulation; and developing a smooth multiple coating substantially devoid of streakiness and blotchiness by drying each coat before a successive coat is applied. The rubber solvent not only swells the dispersed rubber particles and transforms them to a stickier state, but softens an already applied and dried coat so as to ensure a nonpeeling, autogenous weld or fusion between coats. Gasoline or benzene may be used as the rubber solvent—A.P.-C.

Air Doctor for Paper Coating Machines. Killey E. Terry, assignor to S. D. Warren Company. U. S. pat. 2,139,628 (Dec. 6, 1938).—The invention provides a nozzle designed to give an air jet in the form of a relatively thin, elongated sheet or ribbon of relatively non-divergent form. The nozzle comprises a relatively large plenum chamber one side of which, in effect, is materially elongated and flattened to define a throat portion of progressively decreasing cross-sectional area terminating in complemental lips forming a slit. One or both lips provide curves convex to each other—A.P.-C.

Coating Machine. August M. Beecker, assignor to Frank A. Becker. U. S. pat. 2,139,652 (Dec. 13, 1938).—The invention provides various improvements in the mechanical features of paper-coating machines.—A.P.-C.

Drying

Drying Paraffin-Coated Paper. Black-Clawson Company. Brit. pat. 487,414 (June 21, 1938).—Paper, e.g., to which paraffin wax, etc., has been applied from a tank as with rollers, etc., and which has been cooled by submersion in water, passes over a roll, the water flung off being caught by a plate and drained, and then passes

in a curved path past a series of doctor blades on each side and inclined at less than 45° to the paper.—A.P.-C.

Temperature Control for Paper Machine Driers. Hazor J. Smith, assignor to General Motors Corporation. U. S. pat. 2,135,627 (Nov. 8, 1939).—The tension of the incoming sheet is used as a measure of the moisture content, a tensioning roll (e.g., a Stickless roll) being held against the incoming sheet in such manner that the position of the roll is determined by the moisture content of the sheet at any instant. The position of the tensioning roll is translated into movement of a steam supply valve by means of a reversible motor-control unit. In order to provide means for adjusting the range of control of the motor-control unit in accordance with changes in stock, a second motor-control unit is provided which is operated by a hand control or by an automatic thermostat. The ratio of control effected by the first and second motor-control units may be varied in order to provide the desired result. The automatic thermostat may be controlled in accordance with the steam condensate temperature at a selected roll, for the purpose of maintaining the temperature of the rolls substantially uniform when the control of the first unit is interrupted, as for instance, in response to a break in the sheet. Means are provided for manually connecting either the hand control or the thermostat into the circuit, as desired.—A.P.-C.

Process for De-Watering and Drying of Webs or Sheets of Cellulose, Ground Wood and Similar Materials. F. Kienzle & Maschinenfabrik Buckau Wolf A. G. Magdeburg. Ger. pat. 654,535 (July 7, 1934).—Patent concerns the relation of the spacing and diameter of the holes put into the sheet to facilitate uniform de-watering and drying.—J.F.O.

Moisture Control System for Paper Machine Driers. Adams E. Armstrong, assignor to Armstrong Machine Works. U. S. pat. 2,148,720 (Feb. 28, 1939).—The drier temperature is maintained uniform by keeping the steam pressure in the drier constant and by providing means for removing air from the drier by using a dependable steam trap with sufficient air handling capacity. Variations in steam requirements due to variations in moisture content of the sheet are taken care of by suitable variation in the pressure in the main steam header, resulting in changes in steam flow into the drier, the pressure in the drier itself, however, remaining constant. The variations in the pressure in the main header are effected in progressive steps to prevent "hunting."—A.P.-C.

Moisture Control System for Paper Driers. Frederick C. Stamm. U. S. pat. 2,142,037 (Dec. 27, 1938). — The drier rolls are divided into groups, the heat transfer of the last group varying with the moisture content of the web as it passes over this group of rolls. Steam is fed into a main header from which it passes into a series of headers, one for each of the groups of rolls. Steam is laid to the main header through a supply pipe provided with a main control valve. The pipe between the main header and the header for the last group of rolls has a constant pressure control valve and a restricting orifice. The main control valve is regulated in response to the steam flow to the last group of rolls by means of two diaphragm regulators acting differentially. —A.P.-C.

Conveyor for Drying Plants. Sven Wellmar, assignor to Aktiebolaget Svenska Fläktfabriken. U. S. pat. 2,141,578 (Dec. 27, 1938).—The patent provides an arrangement of ropes for conveying paper in a zig-zag path through a drying chamber, the arrangement being such as to permit of operating at high speeds and of facilitating starting up again after a break has occurred in the sheet.—A.P.-C.

Apparatus for Regulating the Moisture Content of Materials Such As Paper. Frank E. P. Klages, assignor to The Powers Regulator Co. U. S. pat. 2,142,789 (Jan. 3, 1939).—There are provided, in combination with a testing bulb having hygroscopic material overlying it to control the supply of heat to a moving body of material, heating means, and means close to and overlying the heating means and the material to serve as a source of supply of substantially saturated air, and the sole source of moisture for the hygroscopic material, the testing bulb being actuated to control the heat supply by variations in the heat and moisture content in the air, the bulb being highly sensitive to heat variations in the air due to the normally high moisture content of the air.—A.P.-C.

Paper Machine Drying Cylinder. Percy R. Sandwell, assignor to Dominion Engineering Works, Ltd. U. S. pat. 2,150,132 (March 7, 1939). —The slip between the condensate and the drier shell is reduced to a minimum by fastening paddles to the inside of the drier shell at a slight angle to the axis of the drier, thereby tending to direct the water to the siphon pipe which is provided with a scoop tip located as close as bottom to the inside surface of the shell.—A.P.-C.

Drying of Continuous Webs of Paper and the Like. J. W. Bell. Brit. pat. 495,906 (Sept. 29, 1937).—The paper enters and leaves a drying chamber through a narrow slot, and while in the chamber passes over and under a number of heated rolls. Steam is removed by a compressor from the chamber at a rate less than that at which it is evolved, the excess steam passing through the slots and preventing entry of air. The compressed steam is used to heat the rolls with make-up from a boiler as necessary.—A.P.-C.

Arrangement for the Drying of Webs, Especially Paper Webs, With the Aid of Electrical High Frequency Fields. Siemens Schuckertwerke A. G., Berlin. Ger. pat. 657,313 (March 31, 1937).—The web of paper is dried by means of electrical high frequency fields in such a manner that the loss in heat to other parts is negligible.—J.F.O.

Paper Specialties

Method and Apparatus for Making Granular Coated Webs. Romie L. Melton, Raymond C. Benner and Henry P. Kirchner, assignors to the Carborundum Company, U. S. pat. 2,141,658, (Dec. 27, 1938)—Abrasive-coated paper is produced by applying adhesive to one surface of a suitable paper in web form, supporting the adhesive coated web with

the coated side downward, and projecting the abrasive grains upwards against the adhesive.—A.P.-C.

Sand Paper. Robert P. Courtney, assignor to Bakelite Corporation, U. S. pat. 2,124,055, (July 19, 1938).—The product is made by coating a fibrous base, such as paper or cloth, with an emulsion of a penetrative synthetic resin varnish composition and a volatile nonsolvent liquid, such as water, applying abrasive particle (e.g., sized sand grains) to the varnish film produced, and hardening the varnish film. An oil-resin composition prepared from cresol, formaldehyde, tung oil, rosin and hexamathylene tetramine, is dissolved, suitably in a mixture of xylene and butyl acetate, and the resulting varnish is emulsified in water (preferably with the aid of an emulsifying agent such as triethanolamine). Fillers, pigments, dyes, etc., may be added. Alternatively, an oil-soluble resin prepared by the reaction of a phenyl-phenol compound with formaldehyde in the presence of a catalyst such as oxalic acid is, after dehydration, heated with a fatty oil such as tung oil. A drier, such as cobalt linoleate, may be added. The resulting oil-resin composition is dissolved, suitably in a petroleum solvent, monoethyl ether of glycol, xylene, or a mixture, and the solution is emulsified, as in an ammoniacal casein solution.—A.P.-C.

Abrasive Coated Products. Raymond C. Benner and Romie L. Melton, assignors to the Carborundum Company, U. S. pat. 2,124,666 (July 26, 1938).—A backing such as paper is coated with an aqueous suspension of abrasive grains containing also a normally solid phenolic resin, water is removed from the suspension, and the article is treated with a solvent for the resin to make the resin adhesive.—A.P.-C.

Noncurling Coated Abrasive Product and Method of Making the Same. Nicholas E. Oglesby assignor to Behr-Manning Corporation. U. S. pat. 2,136,150 (Nov. 8, 1938).—Coating abrasive products of greatly improved non-curling characteristics are obtained by controlling the expansion-contraction characteristics of the paper backing sheet under moisture content changes, and relativing those characteristics to the corresponding characteristic of the particular type of adhesive abrasive coating. The proportion of transversely disposed fibers to longitudinally disposed fibers in the sheet not only control the cross to length tensile strength ratio, but also the ratio between transverse and longitudinal contraction and expansion characteristics of the sheet under changes in moisture content. By the use of equipment such as the Sonbert cylinder machine (U. S. pat. 1,924,154) it is possible to control the cross to length strength ratios within wide limits and produce backing for coated abrasives which have the desired cross to length tensile ratios.—A.P.-C.

Artificial Leather. Charles A. Fourness, assignor to Paper Patents Company. U. S. pat. 2,143,911 (Jan. 17, 1939).—A relatively thin paper is impregnated with latex adhesive. The impregnated paper is creped through the use of the latex adhesive while the paper is still wet. A number of superposed layers of the creped paper is wound upon a reel while still wet to form a roll of laminated material, the individual laminations of which adhere to one another owing to the presence of the adhesive. The material is removed from the reel while the adhesive is still wet, pressed and dried. A product thus made may be used for packing fragile articles such as glassware. —A.P.-C.

Reinforced Building Paper. Thomas J. Fraber. U. S. pat. 2,142,471 (Jan. 3, 1939).—Sheet building paper is provided with reinforcing spaced vertical strips of thin metal provided with upwardly extending tongues and paper holding prongs, and with spaced horizontal thin metal strips crossing the vertical strips to which they are secured by the vertical tongues, the horizontal strips being provided with spaced paper holding prongs which extend from the strips in a direction opposite the tongues. The reinforcing strips act also to key the plaster that is applied to the surface of the sheet.—A.P.-C.

Artificial Leather Sheet Material. Horace A. Sheesley, assignor to Tufide Products Corporation. U. S. pat. 2,146,771 (Feb. 14, 1939).—A sheet material suitable for use as a leather substitute has a body portion comprising 50 to 70% of felted and compressed wood pulp fibers extending in all directions and a binder for the fibers consisting of homogeneous, dehydrated latex and blood albumin tanned in situ.—A.P.-C.

Imitation Leather and Process for its Manufacture. G. H. Vulliet-Durand. Belg. pat. 429,657 (Aug. 31, 1938).—Mineral salts of organic fatty acids are mixed with the stuff.—A.P.-C.

Carbon Paper. Paul V. Brower, assignor to Ditto, Inc. U. S. pat. 2,138,836 (Dec. 6, 1938).—A color paste formed of an oil-soluble salt of a basic dye as its principal color constituent, a wax, a high molecular weight fatty alcohol and a readily volatile solvent is applied to a backing paper to obtain a carbon paper having a color layer of initially porous and unglazed character.—A.P.-C.

Carbon Paper. Maximilian P. Schmidt, assignor to Kalle & Co. A.-G. U. S. pat. 2,146,515 (Feb. 7, 1939).—A carbon paper is provided on one surface with a layer of a dark transfer composition and on its other surface with a layer consisting of a considerably lighter transfer composition comprising a substance such as chrysoidine which absorbs ultraviolet light but is stable to light and serves to avoid smearing.—A.P.-C.

Carbon Paper. K. Koreska. Brit. pat. 496,011 (Jan. 4, 1938).—Carbon paper, having a dark-colored base paper and a wax coating on the reverse side to the transferable coating, is provided with an opaque pigment distributed uniformly over the waxed side. The pigment (titanium dioxide or lithopone) may be printed on to the base paper, preferably after the waxing.—A.P.-C.

Carbon Paper. W. Koreska. Belg. pat. 427,649 (May 31, 1938).—The back of the sheet is coated with wax containing an opaque pigment of a color contrasting with the inked surface of the paper.—A.P.-C.

Carbon Paper. Kalle & Co. A.-G. Brit. pat 487,751 (June 24, 1938).—Carbon paper is prepared with a coating of the usual composition on one side and on the other side is covered with a lighter-colored composition containing a substance that will absorb chemically-active light, e.g., ultraviolet light, so that a copy in reverse is obtained on an original sheet that will facilitate the production of a duplicate by a photographic printing process. Chrysoidin, 3-methyl-4-amino-2'-methylazobenzene, sodium umbelliferone-carboxylate, sodium 4,4'-di-(*p*-dimethylaminobenzoylamino)biphenyl-2,2'-disulphonate, 4-dimenthylominobenzophenone, naphthostyril, acridone or *m*-tolyl-1,2-pseudo-azimido-5-naphthol may be used as the light-absorbing substance, with stearin and tallow, paraffin, wax, ceresin, etc., as binders.—A.P.-C.

Impregnated Cigarette Paper. Richard T. Ub-

ben, assignor to E. I. duPont de Nemours & Co. U. S. pat. 2,137,706 (No. 22, 1938).—Cigarette paper is treated with a composition containing from 0.5 to 2.5% of a vinyl resin.—A.P.-C.

Cigarette Paper. Roger Braunstein, assignor to Société Anonyme des Anciens Etablissements Braunstein Frères. U. S. pat. 2,145,151 (Jan. 24, 1939).—There is incorporated in the pulp 0.8 per cent of stearic acid and 2 per cent of titanium dioxide, on the weight of the paper produced. A.P.-C.

Cigarette Paper. Richard T. Ubben, assignor to Canadian Industries Ltd. Can. pat. 376,701 (Sept. 27, 1938).—Cigarette paper is treated with an aqueous emulsion containing 0.5 to 2.5 per cent of a vinyl resin to render it water-repellent. Typical resins are polymers of styrene, vinylnaphthalene, vinyl chloride or bromide, and vinyl acetate. E.g., a resin solution consists of 2 parts of polystryrene, 31 parts of acetone and 67 parts of toluene, all by weight.—A.P.-C.

Manufacture of Paper. A. S. Lowry. Brit. pat. 492,680 (March 25, 1937).—Paper which is to be wound into cones for use in the textile industry is roughened by abrading with emery, etc. The roughening may be done either to the blank sheet or to the wound cone.—A.P.-C.

Process and Machine For Making Crushed Corrugated Paper. Wm. W. Rowe and Warren A. Morris, assignors to The Paper Service Co. U. S. pat. 2,139,285 (Dec. 6, 1938).—In order to prevent loss of lateral stretchability, longitudinally corrugated creped paper is led into the bite of the crushing rolls by means of the elements which produced the corrugations. —A.P.-C.

Corrugated Structure. Allen L. Spafford, assignor to Wood Conversion Company. U. S. pat. 2,139,138 (Dec. 6, 1938).—A corrugated sheet, which may be either plane or creped in the direction of the lines of corrugation, is faced on one or both sides, and either one or both of the facing sheets may be corrugated in a direction parallel or diagonal to the lines of corrugation.—A.P.-C.

TAPPI Notes

Walter B. Morehouse formerly of the Container Corporation of America is now with Bennett, Inc.

Ray Olsen formerly of the Bryant Paper Company is now with the Pure Calcium Products Division of the Diamond Alkali Company.

John F. Halladay formerly of the Container Corporation of America is now with the Downingtown Manufacturing Company.

D. M. Shapleigh formerly of the Hercules Powder Company is now with the American Delthirna Company.

S. D. Reynolds formerly of the Container Corporation of America is now with the Philadelphia Electric Company.

About eighty excellent papers on pulp and paper manufacture, containers, coating, heat and power and testing have been obtained and will be presented at the annual meeting of the Technical Association of the Pulp and Paper Industry, Roosevelt Hotel, New York, N. Y. February 19-22, 1940.

A feature of the annual meeting of TAPPI will be the two day joint session with the Inter-Society Color Council. Papers will be presented showing the nature and use of optical instruments in pulp making, beater furnish, coated and uncoated papers. This meeting will bring together representatives of such organizations as TAPPI, American Physical Society, American Psychological Association, Optical Soiety of America, A.S.T.M., American Pharmaceutical Association, Association Textile Colorists and Chemists, the Textile Color Card Association and the Society Motion Picture Engineers. Meetings will be held in the Hendrik Hudson Room of the Roosevelt Hotel, New York on February 21-22, 1940. This will be followed by a two day session at Columbia University of the Optical Society of America, the Color Council, of which TAPPI is a member and the American Physical Society.

Effect of Mechanical Gelatinization on the Solubility of Wood in Cuprammonium Solution—

A Correction

Attention is called to an error in the alignment of the figures in Table I of this paper by John Levy and Edwin C. Jahn, as printed in the December 7, 1939 issue, pages 45-49 (TAPPI Section 311-315). The corrected Table is as follows:

TABLE I.—ANALYSIS OF ORIGINAL, ALKALI STEEPED, AND GELATINIZED PINE GROUNDWOOD BEFORE AND AFTER CUPRAMMONIUM FRACTIONATION[1]

	Original Materials				Residues insoluble in cuprammonium solution			Precipitated cuprammonium soluble fractions		
Analysis	Groundwood white pine pulp	Groundwood pulp steeped in dilute alkali	Groundwood pulp gelatinized in water	Groundwood pulp gelatinized in dilute alkali	Groundwood pulp	Pulp steeped in alkali	Gelatinized in dilute alkali	Groundwood pulp	Pulp steeped in alkali	Gelatinized in dilute alkali
Ash[3]	0.44	....	....	5.62	.84	.93	4.36	...	...	...
	0.43	....	....	5.57	.88	.88	4.27	...	...	...
Ether soluble material	2.14	....	....	....	....	....	....	...	...	...
	2.16	....	....	....	....	....	....	...	...	...
Alcohol-benzene soluble material	1.20	....	....	....	....	....	....	...	...	...
	1.21	....	....	....	....	....	....	...	...	...
Cuprammonium[2] soluble material	16.35	21.37	28.00	33.05	....	....	....	...	...	...
	15.30	22.35	26.30	31.40	....	....	....	...	...	...
Lignin	29.55	[2, 3] 28.82, 28.72	....	29.95	35.40	40.50	49.25	6.84	2.43	5.16
	29.85	[2, 4] 29.28, 29.14	....	29.95	35.50	39.70	49.20	7.06	2.49	5.37
Cellulose	61.40, 61.50	[2, 3] 63.80, 64.12	....	63.40	54.40	50.30	39.05	...	...	[6] ...
	61.50, 61.10	[2, 5] 63.80, 63.40	....	62.20	54.20	50.00	38.40	...	...	95.30
Pentosan	11.85	[2, 3] 12.00, 11.70	....	10.15	10.20	10.42	10.45	4.92	5.01	4.50
	11.77	[3, 4] 11.13, 11.00	....	10.16	10.20	10.45	10.47	...	5.26	4.01
Methoxyl	4.64	[2] 4.31	....	4.39	4.60	5.97	6.30	...	...	0.32
	4.66	4.32	....	4.50	4.75	6.01	6.28, 6.25	...	...	0.43
Sum of lignin, cellulose and pentosan	102.9	104.35	....	102.9	100.8	101.2	98.4	...	...	104.8

[1] All results expressed in percentage of oven-dry, ash-free material unless otherwise indicated.
[2] Percentage oven-dry material, not corrected for ash.
[3] Analysis by Philip Bloom.
[4] Analysis by W. F. Murphy.
[5] Analysis by W. Reynolds.
[6] By Cross and Bevan method.

Imports of Paper and Paper Stock

Giving Manifests of New York, Boston, Philadelphia and Other Ports of Newsprint, Wrapping, Writing, Coated, Blotting, Tissue, Strawboard, Wallboard, Cigarette Papers, Sulphite, Kraft and Ground Wood Pulp.

NEW YORK IMPORTS

WEEK ENDING DECEMBER 16, 1939

SUMMARY

Cigarette paper .....455 bbls.
Wall paper .....2 cs.
Newsprint .....3,521 rolls
Wrapping paper .....46 bls., 1 roll
Filter paper .....13 cs.
Filter mass ..... 150 bls.
Surface coated paper .....235 cs.
Photo paper .....1 cs.
Boards .....117 bls.
Miscellaneous paper .....1,208 bls., 828 rolls, 5 cs.

CIGARETTE PAPER

——, *Exeter,* Marseilles, 45 bbls.

WALL PAPER

S. K. Lonegren, ——, Gothenburg, 2 cs.

NEWSPRINT

N. Y. Evening Journal, *Dea,* Quebec, 285 rolls.
Daily Mirror, *Dea,* Quebec, 814 rolls.
Long Island Daily Press, *Dea,* Quebec, 1,738 rolls.
Perkins Goodwin & Co., ——, Gothenburg, 230 rolls.
Nolan Bowmall & Co., Inc., ——, Gothenburg, 145 rolls.
National Pulp & Paper Co., *Oslofjord,* Oslo, 309 rolls.

WRAPPING PAPER

W. I. Chudleigh, ——, Gothenburg, 46 bls.
Freidman & Slater, *Black Osprey,* Antwerp, 1 roll.

FILTER PAPER

E. H. Sargent & Co., ——, Gothenburg, 13 cs.

FILTER MASS

H. Reifenberg, *Black Osprey,* Rotterdam, 150 bls.

SURFACE COATED PAPER

Gevaert Co. of America, *Boschdyk,* Rotterdam, 106 cs.
Gevaert Co. of America, *Black Osprey,* Antwerp, 129 cs.

PHOTO PAPER

Gevaert Co. of America, *Black Osprey,* Antwerp, 1 cs.

BOARDS

Miller Paper Co., ——, Gothenburg, 117 bls.

MISCELLANEOUS PAPER

F. L. Kramer & Co., ——, Gothenburg, 361 bls.
The Borregaard Co., Inc., ——, Gothenburg, 947 bls.
National Pulp & Paper Co., ——, Gothenburg, 828 rolls.
Japan Paper Co., *Exeter,* Genoa, 1 cs.
H. Reeve Angel & Co., Inc., *Kinugasa Maru,* Yokohama, 4 cs.

RAGS, BAGGINGS, ETC.

Castle & Overton, Inc., *Navemar,* Buenos Aires, 137 bls. old rags.
W. Steck, & Co., *Navemar,* Buenos Aires, 64 bls. old rags.
National City Bank, *Aregentino,* Buenos Aires, 10 bls. rags.
W. J. Green, *Ciltvaria,* Murmansk, 333 bls. linen waste, 368 bls. flax waste.
Chase National Bank, *Ciltvaria,* Murmansk, 1,434 bls. linen waste, 63 bls. linen rags.
P. Silverman & Son, *Black Osprey,* Antwerp, 44 bls. rags.

CASEIN

Balfour Guthrie & Co., *Navemar,* Buenos Aires, 847 bags, 50,820 kilos.
A. Hurst & Co., *Brazil,* Montevideo, 1000 bags.
Balfour Guthrie & Co., *Navemar,* Buenos Aires, 847 bags, 50,820 kilos.
A. Hurst & Co., *Brazil,* Buenos Aires, 3,834 bags.
T. M. Duche & Sons, Inc., *Brazil,* Buenos Aires, 417 bags.
American British Chemical Supplies, *Brazil,* Buenos Aires, 1,755 bags.
——, *Brazil,* Buenos Aires, 42 bags.

WOOD PULP

J. Andersen & Co., ——, Gothenburg, 600 bls. dry chemical pulp.
The Borregaard Co., Inc., *Oslofjord,* Sarpsborg, 150 bls. dry unbleached sulphite, 25 tons.
The Borregaard Co., Inc., *Oslofjord,* Sarpsborg, 1,050 bls. dry unbleached pulp, 177 tons.
J. Andersen & Co., *Oslofjord,* Sarpsborg, 300 bls. dry bleached sulphite, 50 tons.
Atterbury Bros., Inc., *Oslofjord,* Oslo, 300 bls. dry mechanical pulp, 50 tons.

WOOD PULP BOARDS

Fibre Case & Novelty Co., ——, Gothenburg, 95 bls.

BAYONNE IMPORTS

WEEK ENDING DECEMBER 16, 1939

Halifax Power & Pulp Co., *Belize,* Sheet Harbor, N.S., 2,520 bls. wet ground wood pulp, 563 tons.

ALBANY IMPORTS

WEEK ENDING DECEMBER 16, 1939

Pagel Horton & Co., Inc., *Garnes,* Sweden, 9,000 bls. wood pulp.
Price & Pierce, Ltd., *Georgia,* ——, 1,500 bls. bleached sulphate, 900 bls. unbleached sulphate, 1,800 bls. unbleached sulphite.
Price & Pierce, Ltd., *Oddvar II,* ——, 9,150 bls. unbleached sulphite.

BOSTON IMPORTS

WEEK ENDING DECEMBER 16, 1939

——, *Mormacsun,* Santos, 112 bls. cotton waste.

PHILADELPHIA IMPORTS

WEEK ENDING DECEMBER 16, 1939

——, *Mormacsun,* Buenos Aires, 600 bags casein.
Halifax Power & Pulp Co., *Belize,* Sheet Harbor, N.S., 5,759 bls. wet ground wood pulp, 1,287 tons.

NORFOLK IMPORTS

WEEK ENDING DECEMBER 16, 1939

F. J. Fawcett, *Black Osprey,* Antwerp, 703 bls. flax waste.

LOS ANGELES IMPORTS

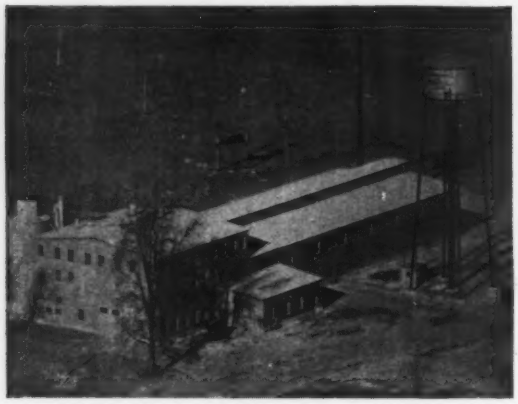
WEEK ENDING DECEMBER 16, 1939

——, ——, Stockholm, 12,000 bls. sulphite, 2,190 tons.
——, ——, Stockholm, 154 bls. newsprint.
——, ——, Helsingfors, 646 bls. wood pulp boards.
——, ——, Kuusankoski, 4,044 rolls newsprint.

Cyanamid Opens Kalamazoo Plant

On Monday, December 18, in Kalamazoo, Mich., the newest plant of American Cyanamid and Chemical Corporation was officially opened. In addition to the local staff, Harry L. Derby, president of the corporation, as well as John F. Fredriksson, vice-president, and Arthur J. Campbell, general sales manager, all of New York City, were in attendance. L. R. Verdon, manager of the Kalamazoo District, will be in charge of the new plant.

The site of the new plant, in Kalamazoo township, is located southeast of the city limits. The 106 acres



NEW PLANT OF AMERICAN CYANAMID CO.

are bound on the north by Recreation Park, on the south by Miller Road and on the west by the Grand Trunk Railroad right-of-way. The building of the second plant in Kalamazoo for the production of industrial chemicals was made necessary by the expanding business of American Cyanamid and Chemical Corporation in the Kalamazoo territory and by the faith of the corporation in the future growth of industries there located. The company has sold its products in the Kalamazoo area for over fifty years and built its first plant in Kalamazoo fifteen years ago.

The policy of American Cyanamid and Chemical Corporation has been gradually to expand its plant facilities as a matter of service to its customers. Two new plants have recently been built in the South to take care of the expanding business in that territory. A total of twenty-seven plants are strategically located throughout the country.

Pulp Shipments From Rumania

According to Nolan, Bowmael & Company, 230 Park avenue, New York, shipments of woodpulp from Rumania have been resumed by the Fabrica de Celuloza Zarnesti, of which the company is sole selling agents. Shipments began promptly after the new Neutrality Laws were enacted and following President Roosevelt's announcement that the Mediterranean and Black Seas were open to American ships.

The company's pulp from Rumania is loaded at Constanza on the Black Sea, comes through the Dardinelles into the Mediterranean and through Gibraltar into the ocean. The first ship, the *S. S. Exporter*, is due early this month.

To Start New Plant After Jan. 15

NORTH TONAWANDA, N. Y., December 18, 1939—Production at the American Boxboard Company's new plant on Shawnee road, the site of the former Kittinger Furniture company will not begin until after January 15, Joseph Day, company representative now acting as supervisor, said last week.

At peak production the plant will employ between 75 and 100 workers. The next few weeks will be used Mr. Day said, in setting up the new machinery which has not yet arrived.

Headquarters for the new plant is located in Grand Rapids, Mich. Charles Burger, general superintendent of the American Boxboard company inspected the new plant setup recently with other company officials. The new unit will not be staffed until after January 1.

Moderates Pulp Testing Requirements

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., December 18, 1939—A circular issued by the Brazilian Ministry of Finance moderated the previous requirements for the perforation of import paper pulp, according to a cable from the American Embassy, Rio de Janeiro. This circular removes certain objectionable features of the perforation requirements with which exporters of paper pulp found it difficult or impossible to comply. Under its terms, the perforations of imported paper pulp need not be aligned horizontally or vertically, provided the perforations are 15 millimeters in diameter if round, or that the bases of triangular or rectangular perforations measure 15 millimeters or more and that the distance between perforations is uniformly 12 centimeters or less.

Norman Harrower Speaks

BOSTON, Mass., December 18, 1939—Norman Harrower, president of Linton Bros. & Co., Fitchburg, Mass., gave a talk on the complete line of products of his company in relation to what will be used in the way of advertising during the coming year at a sales-meeting held at the office of Carter, Rice & Co., Corporation, Saturday morning, December 16. Frank H. Winter, sales manager of the Carter Rice company, presided.

New England Box Plants Busy

[FROM OUR REGULAR CORRESPONDENT]

BOSTON, Mass., December 18, 1939—New England paper box manufacturers as a whole are busy and probably will continue so until December 20, at least.

A number of the box board mills are to have their annual shutdown from December 23 to January 2. Box board manufacturers look forward to a fairly good business after the first of the year.

American Writing Employees Get Bonus

[FROM OUR REGULAR CORRESPONDENT]

HOLYOKE, Mass., December 16, 1939—The employes of the American Writing Paper company today received a Christmas greeting card bearing the signature of Thomas H. Blodgett, chairman of the board and containing a "day's pay" bonus. All employees with the concern for six month or more were included.

Latest Review of Paper and Pulp Markets

Paper Production and Sales Well Maintained For Season On Most Grades of Paper and Paper Board—Pulp Market Firm — Unbleached Sulphite and Unbleached and Bleached Kraft Pulps Scarce — Paper Stocks Soft.

Office of the PAPER TRADE JOURNAL,
Wednesday, December 20, 1939.

Wholesale volume continues to be well maintained at a high level in the New York market, with some distributors reporting a more or less normal slackening in demand commonly occurring just before Christmas. The average level of sales, however, is high and the current opinion in the industry and trade is optimistic of the near future and the expectation of good business for the first quarter of next year.

The present high level of business is indicated in the index of general business activity which was 106.3 per cent for the week ended December 9, from 106.0 per cent for the previous week, compared with 94.4 per cent the like period in 1938, which was the high point last year.

Reports from all parts of the country indicate that this Christmas will prove the most prosperous since 1929. Holiday sales are estimated by the Government at around $6,100,000,000, or about 12 per cent higher than last year, with 1,250,000 more workers employed, wages up 6 per cent and railroad traffic 12 per cent higher than one year ago.

According to the Federal Reserve Board, business in November, as measured by check payments, was 9.32 per cent above the like month last year. The volume of business in the New York area was better than the national average, while in the Midwest it equalled it, and was reported below the national average in California.

Paper production of 195 mills for the week ended December 9 was estimated at 95.7 per cent, compared with 77.6 per cent in 1938, with 56.1 per cent in 1937, and with 93.3 per cent for the corresponding period in 1936.

Paper board production for the week ended December 9 was 79.0 per cent, compared with 64.0 per cent in 1938, with 53.0 per cent in 1937, and with 81.0 per cent for the like period in 1936.

No noteworthy change has been reported in the newsprint situation this week. Domestic production for November totaled 78,886 tons, shipments 81,410 tons. Canadian production for November was 288,726 tons, shipments 287,869 tons. This country produced in eleven months of the current year, 117,406 tons more than for the same period last year, while Canada produced 213,783 tons more. Stocks in domestic mills at the end of November totaled 13,399 tons, while Canadian mill stocks amounted to 193,466 tons. The current price spread of $49 to $50 per ton on roll newsprint is expected to prevail throughout 1940.

Sales volume on all grades of paper are reported as holding up well, with the expected tapering off at this season on some of the grades of fine papers. Because of the good volume of contract orders being placed at this date on future requirements, prospects are viewed as excellent for next year. No important change in the representative quoted market prices on any grade of paper or paper board has been reported this week.

Mechanical Pulp

This market is firm with no important changes in prices reported for the current week.

Chemical Pulp

The chemical pulp market is firm. No important change in contract prices have been reported this week. Prime grades of unbleached sulphite and unbleached and bleached sulphate pulps are reported as scarce.

Old Rope and Bagging

A little more activity is reported in old rope trading this week, but no change in prices have been announced. The old bagging market is a little more active. Prices remain unchanged.

Rags

The domestic rag market continues rather slow, with prices firm on all the better grades. Roofing rags are reported as less active this week.

Old Waste Paper

Some sales of No. 1 mixed paper are reported at under $10 per ton but mills have been supporting that price level. This market is rather soft at this date, with the trend in prices on the lower grades indefinite.

Twine

Demand for many grades of twine is reported good for the season. Prices are firm and unchanged.

Nominating Committee Appointed

[FROM OUR REGULAR CORRESPONDENT]

BOSTON, Mass., December 18, 1939—At a meeting of the New England Paper Merchants Association held at the Boston Chamber of Commerce Thursday, December 14, the following were elected as nominating committee: W. N. Stetson, Jr., Storrs & Bement Company, chairman; F. Bendel Tracy, Fort Hill Paper Company, and Frank H. Winter, Carter, Rice & Co., Corporation.

Germany Releasing Pulp Cargoes

According to reports received from the State Department by the Association of American Wood Pulp Importers, 16 ships loaded with wood pulp consigned to this country have been released by Germany since the non-re-export affidavit plan to expedite shipments of Scandinavian pulp to this country has been in operation.

Finnish Mills Operating

Latest reports from Finland indicate that some pulp mills are still in operation while others within the area of hostilities have been forced to close. Three ships are now being loaded with wood pulp in Finland for shipment to this country.

Miscellaneous Markets

Office of the PAPER TRADE JOURNAL,
Wednesday, December 20, 1939.

BLANC FIXE—Prices on blanc fixe continue firm and conform to prevailing market quotations. The pulp is currently quoted at from $42.50 to $45 per ton, in bulk; the powder is offered at from 3½ to 3¾ cents per pound, in barrels, at works.

BLEACHING POWDER—Quotations on bleaching powder are firm under a good demand. Prices are unchanged at prevailing market levels. Bleaching powder is currently quoted at from $2 to $2.85 per 100 pounds, in drums, at works.

CASEIN—Prices on casein are unchanged for the current week. Standard domestic casein, 20-30 mesh, is currently quoted at 17 cents per pound; 80-100 mesh, at 18 cents per pound; all prices in bags, car lots. Argentine casein is currently quoted at 14 cents per pound. Prices on French casein at 14 cents per pound are nominal.

CAUSTIC SODA—Quotations on caustic soda are firm under a good demand. Solid caustic soda is currently quoted at from $2.30 to $2.40 per 100 pounds; flake and ground at from $2.70 to $2.95 per 100 pounds, in drums, at works.

CHINA CLAY—Prices of china clay continue firm under a steady demand. Domestic filler clay is currently offered at from $7 to $15 per ton; coating clay at from $11 to $22 per ton, at mines. Imported clay is quoted at from $13.50 to $25 per ton, ship side.

CHLORINE—Quotations on chlorine continue firm under a fairly active demand and conform to prevailing market levels. Chlorine is currently offered at $1.75 per 100 pounds, in single-unit tank cars, f.o.b., works.

ROSIN—The rosin market is reported as firm for the week. Prices on some grades are a little lower. "G" gum rosin is currently quoted at $5.10 per 280 pounds, gross weight, in barrels, at Savannah. "FF" wood rosin is quoted at $4.90 per 280 pounds, gross weight, in barrels, New York. Seventy per cent gum rosin size is quoted at $2.78 per 100 pounds, f.o.b., shipping point.

SALT CAKE—Prices on saltcake continue to be reported as very firm and practically nominal under a heavy demand. Current quotations range at from $15 to $19 per ton; chrome salt cake at from $15 to $16 per ton, f.o.b., shipping point. Quotations on imported salt cake are nominal.

SODA ASH—Quotations on soda ash are firm under a fairly good demand and conform to prevailing market prices. Quotations on soda ash in car lots, at works, per 100 pounds, are as follows: in bulk, $.90; in bags, $1.10; and in barrels, $1.35.

STARCH—Prices on corn starch are reported a little higher for the current week. Globe pearl is currently quoted at $2.50 per 100 pounds; special paper starch at $2.60 per 100 pounds. All prices in bags, f.o.b., Chicago.

SULPHATE OF ALUMINA—Quotations on sulphate of alumina are firm under a steady demand. The commercial grades are currently quoted at $1.15 per 100 pounds; iron free at $1.45, per 100 pounds, in bags, car lots, f.o.b., works.

SULPHUR—Prices on sulphur are firm under a steady demand and conform to prevailing market quotations. Annual contracts are currently quoted at $16 per long ton, f.o.b., mines. Spot and nearby car lots are quoted at $19 per ton.

TALC—Quotations on talc are reported as firm and conform to prevailing market levels. Domestic talc is currently quoted at from $15 to $18 per ton, Eastern mines. Imported talc is offered at from $23 to $45 per ton.

Market Quotations

Paper

(Delivered New York)

News, per ton—			
Roll, contract	$50.00	@	—
Sheets	58.00	"	—
Kraft—per cwt.—Delivered Zone A			
Northern, Extra Quality	$4.87½	@	$5.50
Superstandard	4.50	"	5.00
Northern Standard Wrapping	4.25	"	4.50
Standard Wrapping	4.00	"	—
Tissues—Per Ream—Carlots			
White No. 1	.87½	@	—
White No. 1 M. G.	.85	"	—
White No. 1½	.70	"	—
White No. 2	.65	"	—
Anti-Tarnish M. G.	.75	"	—
Colored	.80	"	—
Kraft	.75	"	—
Manila	.65	"	—
Unbl. Toilet, 1 M.	3.50	"	—
Bleached Toilet	5.26	"	—
Paper Towels, Per Case—			
Unbleached, Jr.	1.85	@	—
Bleached, Jr.	3.20	"	—
Manila—per cwt.—C. l. f. a.			
No. 1 Jute	8.25	@	10.25
No. 1 Manila Wrapping, 35 lb.	5.25	"	—
No. 2 Manila Wrapping, 35 lb.	5.00	"	—
Boards, per ton—			
News	45.00	@	—
Chip	45.00	"	—
Sgl. Mla. Ll. Chip	57.50	"	—
Jute Lined Chip	57.50	"	—
White Pat. Coated	70.00	"	—
Kraft Liners	55.00	"	—
Binders Boards	76.00	"	87.00

The following are representative of distributors' resale prices:

Rag Content Bonds and Ledgers—White, Assorted Items, Delivered in Zone 1:

	Bonds	Ledgers
100% Rag Ext. No. 1	$39.10@$46.00	$40.25@$47.25
100% Rag	31.05 " 36.50	32.20 " 37.75
85% Rag	.... "	29.90 " 35.00
75% Rag	23.60 " 27.75	24.75 " 29.00
65% Rag	.... "	21.65 " 26.25
50% Rag	17.55 " 21.50	18.70 " 22.75
25% Rag	14.65 " 17.75	15.80 " 19.25

Colors at $1.00 cwt. extra.

Sulphite Bonds and Ledgers—White, Assorted Items, Delivered in Zone 1:

	Bonds	Ledgers
No. 1	$8.95@$11.00	$10.10@$12.25
No. 2	8.05 " 9.75	9.25 " 11.25
No. 3	7.60 " 9.25	8.50 " 10.75
No. 4	7.30 " 9.00	8.50 " 10.25

Colors $1.00 cwt. extra.

Free Sheet Book Papers—White, Cased Paper, Delivered in Zone 1:

No. 1 Glossy Coated	$11.90	@	$13.50
No. 2 Glossy Coated	10.35	"	11.75
No. 3 Glossy Coated	9.55	"	11.00
No. 4 Glossy Coated	9.15	"	10.50
No. 1 Antique (watermarked)	8.35	"	9.50
No. 2 Offset	7.70	"	9.00
A Grade E. F.	7.50	"	8.75
A Grade S. & S. C.	7.75	"	9.00
B Grade E. F.	6.95	"	8.00
B Grade S. & S. C.	7.20	"	8.25
C Grade E. F.	6.65	"	7.75
C Grade S. & S. C.	6.90	"	8.00
D Grade E. F.	6.40	"	7.50
D Grade S. & S. C.	6.65	"	7.75

Ivory & India at $.50 cwt. extra.

Mechanical Pulp

(On Dock, Atlantic Ports)

No. 1 Imported—			
Moist	$34.00	@	36.00
Dry	34.00	"	36.00
(Delivered)			
No. 1 Domestic and Canadian	40.00	@	42.00

Chemical Pulp

(On Dock, Atlantic, Gulf and West Coast Ports)

Bleached Sulphite (Domestic and Foreign)—			
Prime Bleached Sulphite	3.00	@	3.25
Prime Qualities—			
Easy-Bleaching Sulphite	2.30	"	2.50
Strong Unbleached Sulphite	2.20	"	2.40
(On Dock, Atlantic Ports)			
Kraft Bleached	3.00	@	3.25
Kraft Light & Strong	1.65	"	1.80
Kraft No. 1	1.60	"	1.75
(F. o. b. Pulp Mill)			
Kraft Domestic	1.60	"	2.12½
(Delivered)			
Soda Bleached	2.90	"	—

Add 60 cents per short ton, dock charges for Albany; $2.50 for Lake Ports East and $3.50 for Lake Ports West of Mackinac Straits. Also add extra freight charges and war insurance to all quotations on imported pulp.

Domestic Rags

New Rags

(Prices to Mill f. o. b. N. Y.)

Shirt Cuttings—			
New White, No. 1	7.50	@	7.75
Silesias No. 1	5.25	"	5.50
New Unbleached	7.75	"	8.00
Blue Overall	5.50	"	5.75
Fancy	2.50	"	3.00
Washables	2.15	"	2.25
Mixed Khaki Cuttings	2.75	"	3.00
O. D. Khaki Cuttings	3.00	"	3.25

Old Rags

White, No. 1—			
Repacked	3.50	"	4.00
Miscellaneous	3.00	"	3.25
White, No. 2—			
Repacked	1.25	"	2.75
Miscellaneous	1.75	"	1.90
Thirds and Blues—			
Repacked	2.00	"	2.25
Miscellaneous	1.75	"	1.90
Roofing Rags—			
No. 1	1.70	"	1.80
No. 2	1.25	"	1.30
No. 3 (bagging)	1.50	"	1.60
No. 4	.60	"	.65
No. 5A	.60	"	.65

Foreign Rags

All prices nominal.

New Rags

New Dark Cuttings	2.25	@	2.40
New Mixed Cuttings	2.00	"	2.20
New Light Silesias	5.50	"	5.75
Light Flannelettes	5.50	"	5.75
New White Cuttings	7.00	"	7.50
New Light Oxford	4.00	"	4.50
New Light Prints	3.00	"	3.25

Old Rags

No. 1 White Linens	7.50	"	8.50
No. 2 White Linens	6.50	"	7.50
No. 3 White Linens	4.50	"	—

PULP

BLEACHED SULPHITE
'Stormont' Grade

BLEACHED SODA
'Seagull' Grade

GROUNDWOOD
'Crabtree' Grade

BLEACHED KRAFT
'Tuftare Fibre' Grade

made by

HOWARD SMITH PAPER MILLS LIMITED
407 McGill St., Montreal, Canada

Sulphite & Soda Mill: Cornwall, Ont. Groundwood Mill: Crabtree Mills, P.Q. Kraft Mill: Windsor Mills, P.Q.

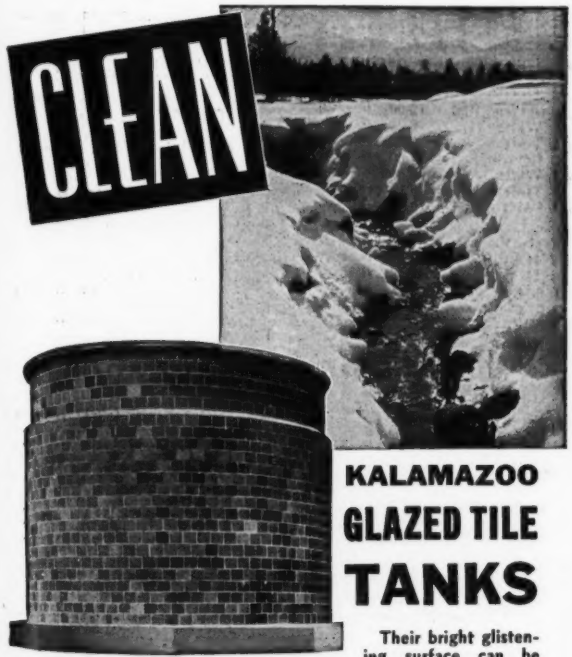
CAMACHINE 14

For use as winder or re-winder in connection with paper or board machines. Operates at speeds up to 1400 F. P. M.

WRITE FOR FOLDER.

CAMERON MACHINE COMPANY
61 Poplar St. BROOKLYN, N.Y.

CLEAN



KALAMAZOO GLAZED TILE TANKS

Their bright glistening surface can be kept absolutely clean by a few minutes wash down with a hose—no slime, no concrete chips. Impervious to the action of ordinary stock fluids.

Manufacturers of wood tanks for 60 years.

KALAMAZOO TANK & SILO CO.
KALAMAZOO, MICHIGAN

More than just a **TRADE MARK**

EXCELSIOR Woolen Co. KNOX Camden, Me. FELTS & JACKETS

BUT also a guarantee by men who for 75 years have prided themselves in making finer felts. TO YOU —this is the mark of dependability, longer felt life and greater saving.

KNOX WOOLEN CO.
CAMDEN, MAINE.

No. 4 White Linens.	2.25	@	3.25
No. 1 White Cotton.	4.25	"	4.75
No. 2 White Cotton.	3.25	"	3.75
No. 3 White Cotton.	2.50	"	3.00
No. 4 White Cotton.	1.90	"	2.20
Extra Light Prints..	2.00	"	2.40
Ord. Light Prints...	1.75	"	2.15
Med. Light Prints...	1.55	"	1.95
Dutch Blue Cottons.	2.25	"	2.50
French Blue Linens..	3.00	"	—
Checks and Blues...	2.00	"	—
Linsey Garments....	1.90	"	2.00
Dark Cottons.....	1.50	"	1.60
Old Shopperies.....	1.30	"	1.45
New Shopperies.....	1.45	"	1.50
French Blues.....	2.25	"	2.50

Old Rope and Bagging

(Prices to Mill, f. o. b. N. Y.)

Gunny No. 1—			
Foreign	2.50	@	2.75
Domestic	2.25	"	2.50
Wool Tares, light...	1.75	"	2.00
Wool Tares, heavy..	1.80	"	1.90
Bright Bagging.....	2.25	"	2.50
Manila Rope—			
Foreign	4.25	"	4.50
Domestic	4.25	"	4.50
Jute Threads.....	3.00	"	3.25
Sisal Strings.....	2.00	"	2.25
Mixed Strings.....	.70	"	.85

Old Waste Papers

(F. o. b. New York)

Shavings—			
White Envelope Cuttings	2.75	@	3.25
Ordinary Hard White No. 1....	2.25	@	2.50
Soft White No. 1..	1.80	"	1.90
Soft White Extra..	2.50	"	2.60
Flat Stock—			
Stitchless	1.10	"	1.25
Overissue Mag....	1.00	"	1.10
Solid Flat Book...	.90	"	1.00
Crumbled No. 1...	.70	"	.75
Ledger White Stock.	1.55	"	1.65
Ledger Stock Colored	1.05	"	1.15
Manila—			
New Env. Cut....	1.70	"	1.80
New Cuttings.....	1.40	"	1.50
Old Kraft Machine—			
Compressed bales..	1.00	"	1.10
News—			
No. 1 White News	1.75	"	1.90
Strictly Overissue.	.70	"	.75
Strictly Folded....	.55	"	.60
Corrugated	.60	"	.65
No. 1 Mixed Paper..	.52½	"	.57½

Twines

(F. o. b. Mill)

(Soft Fiber)

Coarse Polished—			
India	.18½	@	—
White Hemp.....	.18½	"	—
Fine Polished—			
Fine India.....	.23	"	—
Unpolished—			
Box	.14¾	"	—
Paper Makers.....	.15	"	—
Tube Rope.....	.16¼	"	—
Wall Paper.....	.15¾	"	—
Wrapping	.18	"	—
Soft Fiber Rope...	.16¾	"	—
Cotton	.21	"	—

(Hard Fiber)

Medium Java.....	.19	"	—
Mex. Sisal.....	.16	"	—
Manila	.24	"	—
Domestic	4.00	@	4.50
Sisal Rope	2.25	"	2.50
Mixed Rope	.75	"	1.00
Transmission Rope ..	3.00	"	—
Soft Jute Ropes.....	3.25	"	3.50
Jute Carpet Threads.	1.25	"	1.50
Gunny Bagging—			
Foreign	2.50	"	—
Domestic	2.25	"	2.30
Bleachery Burlap....	3.50	"	3.75
Scrap Burlap—			
Foreign	2.40	"	2.50
Domestic	1.90	"	2.00
Scrap Sisal	2.25	"	2.35
Scrap Sisal for Shredding	2.50	"	2.60
Wool Tares, Heavy..	2.50	"	2.60
New Burlap Cuttings	3.25	"	3.50
Aust. Wool Pouches.	3.25	"	3.50
Heavy baling bagging	2.65	"	2.75
Paper Mill Bagging..	1.25	"	1.50
No. 2 Bagging	1.10	"	1.25

Domestic Rags (New)

(F. o. b. Boston)

Shirt Cuttings—			
New Light Prints...	.03¼	@	.03½
New White No. 1...	.08	"	.08¼
New Light Flannelettes	.05	"	—
Silesias No. 1	.05	"	—
New Black Silesias..	.03½	"	03¾
Soft Unbleached....	7.50	"	8.00
Blue Cheviots	.05½	"	.06
Fancy	.02	"	.02½
Washable	.02	"	.02½
Cottons—According to grades—			
Blue Overalls	.05¼	"	.05½
New Black, soft ..	.03¼	@	.04
Khaki Cuttings	.02½	"	.03
O. D. Khaki	03	"	.03¾
Corduroy	.02¾	"	.03
New Canvas.....	.06¾	"	.07¼
B. V. D. Cuttings...	.07	"	.07½

Domestic Rags (Old)

(F. o.b. Boston)

Canvas	.04¼	@	—
White No. 1—			
Repacked	—	"	2.75
Miscellaneous	2.50	"	2.75
White No. 2—			
Repacked	1.90	"	2.00
Miscellaneous	2.00	"	2.25
Twos and Blues	2.25	"	2.50
Old Blue Overalls ..	1.60	"	2.00
Thirds and Blues—			
Repacked	2.00	"	2.25
Miscellaneous	1.50	"	1.60
Black Stockings	4.00	"	4.25
Roofing Stock—			
No. 1.....	1.75	"	2.00
No. 2.....	1.60	"	1.65
No. 3.....	1.00	"	1.25

Foreign Rags

(F. o. b. Boston)

Dark Cottons.....(nominal)	
Dutch Blues.....(nominal)	
New Checks and Blues(nominal)	
Old Fustians.....(nominal)	
Old Linsey Garments.(nominal)	
New Silesias.....(nominal)	

PHILADELPHIA

Domestic Rags (New)

(Price to Mill, f.o.b. Phila.)

Shirt Cuttings—			
New White No. 1.	.07¼	@	.07½
New White No. 2.	.04	"	.04½
Light Silesias.....	—	"	.04½
Silesias No. 1....	—	"	.04½
Black Silesias, soft	—	"	.03¾
New Unbleached..	.05½	"	.06
Washable, No. 1..	—	"	.04
Blue Overall.....	—	"	.05
Cottons—According to grades—			
Washable No. 2...	—	"	.02
New Blue	—	"	.02
Fancy Percales....	—	"	.03
New Black Soft...	—	"	.04
New Light Seconds	.04½	"	.05
New Dark Seconds	—	"	1.50
Khaki Cuttings—			
No. 1 O. D.....	.03½	"	.04
No. 2 Mixed.....	.03	"	.03¼
Corduroy	—	"	.02½
New Canvas.....	.05½	"	.06
New Black Mixed.	—	"	.03

Domestic Rags (Old)

White No. 1—			
Repacked	3.50	@	4.00
Miscellaneous	2.75	"	3.00
Thirds and Blues—			
Miscellaneous	2.00	"	2.25
Repacked	2.50	"	2.75
Black Stockings (Export)	3.50	"	4.00
Roofing Stock—			
Foreign No. 1....Nominal			
Domestic No. 1..	1.50	"	1.60
Domestic No. 2...	1.35	"	1.45
Roofing Bagging..	—	"	1.30

Bagging

(f.o.b. Phila.)

Gunny, No. 1—			
Foreign .....Nominal			
Domestic	2.50	@	3.00
Manila Rope.....	—	"	4.50
Sisal Rope.....	1.75	"	2.00
Mixed Rope.....	1.25	"	1.50
Scrap—			
No. 1.....	2.50	"	2.75
No. 2.....	—	"	1.40
Wool Tares, heavy..	3.50	"	3.70
Mixed Strings	.75	"	1.00
No. 1 New Light Burlap	3.00	"	3.50
New Burlap Cuttings	2.00	"	2.25

Old Papers

(f.o.b. Phila.)

Shavings—			
No. 1 Hard Write	2.25	@	2.30
No 2 Hard White	2.00	"	2.10
No. 1 Soft White	1.85	"	1.90
No. 2 Soft White	1.50	"	1.60
No. 1 Mixed.....	.90	"	1.00
Solid Ledger Stock..	1.50	"	1.60
Ledger Stock, white	1.30	"	1.35
Ledger Stock, colored	1.00	"	1.10
No. 1 Books, heavy..	.90	"	1.00
Manila Cuttings.....	1.90	"	2.00
Print Manila.....	.70	"	.75
Container Manila...	.65	"	.70
Kraft Paper.....	1.00	"	1.10
No. 1 Mixed Paper..	.55	"	—
Straw Board Chip..	.50	"	—
Binders Board Chip	.50	"	—
Corrugated Board...	.60	"	.65
Overissue News.....	.70	"	.75
Old Newspapers.....	.55	"	.60

BOSTON

Old Papers

(f.o.b. Boston)

Shavings—			
No. 1 Hard White	2.25	@	2.50
No. 1 Soft White	1.85	"	2.15
No. 2 Mixed.....	.75	"	.80
Solid Ledger Books..	1.30	"	—
Overissue Ledger Stock	1.30	"	1.50
Mixed Ledgers.....	.85	"	.90
No. 1 Books, heavy..	1.00	"	1.10
No. 1 Books, light..	.65	"	.75
Crumpled Stitchless Book Stock.....	.55	"	.65
Manila Env. Cuttings	1.70	"	1.85
Manila Envelope Cuttings, extra quality	2.35	"	2.60
White Blank News..	1.40	@	1.50
No. 1 Kraft.....	1.10	"	1.20
Mixed Papers.....	.40	"	.45
Print Manila.....	.70	"	.75
Container Manila...	.60	"	.70
Old Newspapers....	.60	"	.65
Paper Wool Strings	.80	"	.90
Overissue News.....	.70	"	.75
Box Board Chips....	.52½	"	.55
Corrugated Boxes....	.60	"	.62½
Kraft corrugated boxes	1.00	"	1.05
Screening Wrappers	.60	"	.70

Bagging

(f.o.b.Boston)

Manila Rope—			
Foreign	4.25	@	4.50

TORONTO

Paper

Bonds

Direct mill shipment in two-ton lots.			
N. 1 White $35.50		@	—
No. 1 Tints	36.50	"	—
No. 2 White	25.50	"	—
No. 2 Tints	26.50	"	—
No. 2 Golden Rod..	27.50	"	—
No. 3 White	21.00	"	—
No. 4 White	15.00	"	—
No. 4 Tints	16.00	"	—
No. 4 Golden Rod	17.00	"	—
Direct mill shipment in three-ton lots.			
No. 5 White $10.50		@	—
No. 5 Tints	11.50	"	—
N. 5. Golden Rod..	12.00	"	—
No. 6 White	9.00	"	—
No. 6 Tints	9.50	"	—
No. 6 Golden Rod..	11.00	"	—
No. 7 White	8.00	"	—
No. 7 Tints	8.50	"	—
No. 7 Golden Rod..	10.00	"	—
Book—			
No. 1 M. F.	$7.00	"	—
No. 2 M. F.	6.50	"	—
No. 3 M. F.	5.35	"	—
No. 1 S. C.	7.25	"	—
No. 2 S. C.	6.75	"	—
No. 3 S. C.	5.85	"	—

Coated Book & Litho

Ton Lots (resale)

No. 1 .....$12.00		@	—
No. 2	10.25	"	—
No. 3	8.90	"	—
Coated tinted.....	13.00	"	—
Wrapping—delivered—			
Rag Brown.....	4.85	"	5.25
White Wrap.....	4.00	"	—
"B" Manila.....	4.90	"	6.15
No. 1 Manila....	$5.50	@	$6.90
Fiber	5.50	"	6.90
Kraft No. 2.....	5.50	"	6.90

(f.o.b. Cars, Toronto)

News per ton—			
Rolls (contract)..	46.00	"	—
Sheets	54.00	"	—

Pulp

Ground wood.....$36.50		@	—
Unbleached sulphite	54.00	"	—
Bleached sulphite...	64.00	"	—
Kraft	47.50	"	—
Soda	58.00	"	—

Old Waste Paper

(In carload lots, f.o.b. Toronto)

Shavings—			
White Env. Cut..	2.15	@	—
Soft White.....	2.00	"	2.15
White Blk. News..	1.35	"	1.50
Book and Ledger—			
Flat Magazine and Book Stock (old)	.90	"	1.00
Light and Crumpled Book Stock.....	.80	"	.90
Ledgers and Writings	1.15	"	—
Manilas—			
New Manila Cut..	1.55	"	1.60
Printed Manilas...	.76	"	—
Kraft	1.15	"	—
News and Scrap—			
Strictly Overissue	.75	"	—
Strictly Folded ..	.70	"	—
No. 1 Mixed Paper	.60	"	—

CHICAGO

Waste Paper

(f.o.b. Chicago)

Shavings—			
No. 1 White Envelope cuttings..	2.40	@	—
No. 1 Hard White	2.23	"	—
No. 1 Soft White	2.00	"	—
Ledger and Writings	1.20	"	—
Solid Books.....	.95	"	—
Blanks	1.70	"	—
Krafts	1.00	"	—
New Kraft Cuts.....	1.60	"	—
Overissue News.....	.80	"	—
Old Newspapers—			
No. 1 Folded News	.73	"	—
No. 1 Mixed Paper	.63	"	—
Roofing Stocks—			
No. 1	1.25	@	—
No. 2	1.15	"	—

ward Bound

To the Covington, Virginia mill of the West Virginia Pulp & Paper Company—(5) "Impco" 8' x 10' Rubber Covered Washers with repulpers and weirs; also Bleaching Equipment.

We have furnished many other vacuum machines, as well as Knotters, Centrifugal Screens, Flat Screens with Dunbar Drive, Deckers and Wet-machines to their mills at Mechanicville, N. Y., Charleston, South Carolina; Piedmont, West Va.; Williamsburg, Pa. and Tyrone, Pa.

IMPROVED PAPER MACHINERY CORP., NASHUA, N. H.

ERS TO COVINGTON, VIRGINIA

COUNTER-CURRENT PAPER STOCK WASHERS, DECKERS, WET MACHINES, INCLUDING HYDRAULIC WITH HIGH DENSITY VACUUM WET END · THORNE BLEACHING EQUIPMENT PNEUMATIC WATER FILTERS · THE IMPCO LINE OF "IMPROVED" EQUIPMENT IS ASSISTING IN THE ECONOMICAL PRODUCTION OF QUALITY PULP AND PAPERS